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Updated compilation of information on mitigation benefits of actions, initiatives and options to enhance mitigation ambition

Technical paper

Summary

This updated technical paper compiles information on the mitigation and sustainable development benefits of actions, initiatives and options to enhance mitigation ambition, with a focus on the thematic areas of renewable energy and energy efficiency. Information for the update was provided in submissions from Parties and observer organizations and at the technical expert meetings held during the fourth part of the second session of the Ad Hoc Working Group on the Durban Platform for Enhanced Action, held in March 2014 in Bonn, Germany. This technical paper builds on the second version thereof, contained in document FCCC/TP/2013/8 and its two addenda FCCC/TP/2013/8/Add.1 and 2, and consists of the main document and an addendum. The addendum is focused on mitigation action in the thematic areas of renewable energy and energy efficiency and elaborates on mitigation potential, progress, benefits, costs and barriers, as well as on good practice policies, key opportunities and options for catalysing action in those two thematic areas.

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I. Background

A. Mandate

1. This update of the technical paper on mitigation benefits of actions, initiatives and options to enhance mitigation ambition was requested by the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) at the third part of its second session.[1] The first and second versions of this technical paper were published on 28 May and 30 October 2013, respectively, and are contained in documents FCCC/TP/2013/4 and FCCC/TP/2013/8 and Add.1 and 2. This version of the technical paper does not supersede those documents, but rather builds on the findings, information and options to enhance mitigation ambition contained therein.

2. It compiles information on actions with high mitigation potential, drawing on information provided in the submissions from Parties and observer organizations made by 30 March 2014 and at the technical expert meetings (TEMs) on unlocking mitigation potential for raising pre-2020 ambition through renewable energy (RE) deployment and energy efficiency (EE) improvements held in March 2014 during the fourth part of the second session of the ADP.[2] The aforementioned submissions and the discussions held at the TEMs focused on the following considerations:

(a) Opportunities for actions with high mitigation potential, including those with adaptation and sustainable development co-benefits, with a focus on the implementation of policies, practices and technologies that are substantial, scalable and replicable;

(b) Ways to promote voluntary cooperation on concrete actions in relation to identified mitigation opportunities in accordance with nationally defined development priorities;

(c) Mitigation actions, policies, practices and technologies, including their mitigation benefits, costs and co-benefits, as well as barriers to their implementation and strategies to overcome those barriers;

(d) Finance, technology and capacity-building support for mitigation action in developing country Parties.

3. This technical paper is based on the 18 submissions, including the four submissions from Parties or groups of Parties and the 14 submissions from observer organizations, received by the secretariat by 21 May 2014 and on the information provided at the TEMs referred to in paragraph 2 above. Information provided by the leading international organizations and partnerships specialized in RE and EE, such as the International Renewable Energy Agency (IRENA), the International Energy Agency (IEA), the United Nations Sustainable Energy for All (SE4All) and the International Partnership for Energy Efficiency Cooperation (IPEEC), was also compiled for this update of the technical paper.

[1] FCCC/ADP/2013/3, paragraph 30(c)(ii).

[2] Detailed information on the TEMs held in March, including the initial summaries of discussions at the meetings, is available at <http://unfccc.int/bodies/awg/items/8112.php> and <http://unfccc.int/bodies/awg/items/8113.php>.

B. Objective and approach

4. The objective of this update of the technical paper is to compile information on the mitigation benefits of actions, initiatives and options to enhance mitigation ambition and other relevant considerations, as requested by the ADP in its conclusions at the third part of its second session, in order to promote action under workstream 2 of the ADP[3] in the pre-2020 period.

5. It focuses primarily on contributing to shifting the work being conducted within the ADP process from the discussion of mitigation potential to the realization of actions by highlighting substantial, scalable, successful and innovative good practices on the ground and drawing forth lessons learned and good practices to support replication and scaling up. Opportunities for RE deployment and EE improvements are the primary areas of emphasis in this update of the technical paper.

6. The next update of this technical paper, to be made available before the twentieth session of the Conference of the Parties, will cover other thematic areas with high mitigation potential, including land use, urbanization and carbon management, among others. It will draw information from further TEMs, which will be focused on those topics, to be held later in the year.

7. The information presented in this technical paper does not imply that there is consensus among Parties on any of the issues or options covered in the relevant submissions and at the TEMs. Rather, it provides an overview of the information provided, relevant policy options and support, in accordance with its mandate.

C. Structure of the technical paper

8. This technical paper begins by providing background information on the relevant context and an explanation of the logical framework used for the paper (chapter II). Chapters III and IV present key findings related to opportunities for RE deployment and EE improvements and elaborate on substantial, scalable and replicable policies to move from the identification of mitigation opportunities to the realization of options. Specifically, chapters III and IV present information on: mitigation potential, progress, benefits, costs and barriers; and practices, policies and actions to catalyse RE deployment and EE improvements. Options related to the means of support for actions addressing RE- and EE-related opportunities undertaken by developing countries are discussed in chapter V, while possible next steps to be undertaken by Parties, leading organisations and partnerships and the secretariat to support RE- and EE-related actions are presented in chapter VI. Finally, chapter VII concludes the paper with possible practical approaches to connecting policy needs with support options that could be considered as follow-up activities under ADP workstream 2 in 2015.

9. Throughout the paper, a number of country-specific examples (provided in the spotlight boxes), drawn from countries' experiences described during the TEMs and included in the relevant submissions, are presented in order to highlight successful, scalable and replicable actions on the ground.

10. The addendum to this technical paper, on the technical examination process of unlocking mitigation potential in the pre-2020 period, provides a technical summary of the discussion on the examination of opportunities for action in the areas of RE and EE. It also provides a technical overview of mitigation potential, progress, barriers, costs and opportunities, followed by a chapter focusing on good practice policies, practices and technologies to enhance mitigation ambition and inspire concrete action.

[3] Workstream 2 of the ADP addresses matters related to paragraphs 7 and 8 of decision 1/CP.17.

II. Main findings

Box 1

Key messages

- The goal of keeping global average temperature increases below 2 °C agreed under the UNFCCC is achievable at a relatively low cost,[a] but only if concrete and transformative policies and actions are immediately implemented, reinforced by robust leadership and adequate support.
- Energy-sector transformation through scaled-up diffusion of renewable energy and energy efficiency could play a major role in raising pre-2020 ambition and contribute significantly to reaching the 2 °C goal because of the proven significant mitigation potential. To be successful, actions to achieve such transformation should be in line with national development priorities, overall political context and circumstances.
- Political, technical, economic and capacity-related barriers still hamper the translation of ambition into action and full utilization of the mitigation potential. Yet, there are many opportunities to overcome such barriers that can bring multiple co-benefits.
- In many cases, growth and sustainable development co-benefits, such as cost savings, poverty reduction, energy security, improved public health, reductions of pollutants and biodiversity improvements are the main driving force for action. The examples show that assessing and communicating the multiple co-benefits of mitigation action is essential to ensuring alignment with a country's broader development context.[b]
- To support renewable energy deployment and utilize the significant mitigation potential, countries have successfully implemented various policies, including: renewable energy targets and quotas; pricing policies, such as feed-in tariffs, carbon pricing and establishing price stabilization funds; and fiscal incentives, such as direct subsidies and tax credits, among others.
- To realize significant energy efficiency improvements and utilize the significant mitigation potential, countries have deployed various policies, including: standards and labeling programmes; fiscal incentives; pricing policies; and nationally tailored research and development initiatives, among others.
- A host of options exist to enable the implementation of such policies at the national levels, including public sector leadership, flexible policy design that allows for adjustments over time, diverse stakeholder engagement and long-term regulatory and financial actions to support change.[c]
- At the international levels, cooperative initiatives and partnerships with engagement of Parties, the UNFCCC institutions and other relevant intergovernmental organisations, private sector and other non-State actors can play a critical role in promoting key mitigation actions, provided they do not burden developing countries.
- Meaningful mitigation action can be further strengthened through the development of good practice policy menus, which bring about growth and sustainable development benefits. Policy menus can provide options and a concrete outcome of aligning good practice policies with internationally available support as a means to achieve key climate and development goals. As shown in this paper, such menus can be an encouraging and supportive outcome of the technical examination process under workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action.

Note: These key messages are based on the findings of the second version of this technical paper contained in document FCCC/TP/2013/8 and Add.1 and 2 as well as on the findings contained in this update of the technical paper.

[a] *Source*: Intergovernmental Panel on Climate Change. 2014. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press.

[b] *Source*: International Energy Agency. 2014. *Capturing the Multiple Benefits of Energy Efficiency: A Handbook for Policy Makers and Evaluators*.

[c] *Source*: World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.

A. Context

11. Limiting the increase in global average temperature to remain below 2 °C,[4] as established in the 2010 Cancun Agreements, presents a major challenge for the international community and urgent action is required to move from discussing mitigation potential to realizing action. To demonstrate their dedication to fulfilling the Cancun Agreements, more than 90 Parties made conditional and unconditional pledges to reduce their emissions by 2020. Developed countries' pledges include quantified economy-wide emission reduction targets and commitments,[5,6] while developing countries pledged to pursue nationally appropriate mitigation actions (NAMAs).[7,8] The pledges represent approximately 80 per cent of the total global emissions but, while significant, will not be sufficient to meet the 2 °C goal.

12. While both pledges and other voluntary activities have led to considerable progress and the full realization of all actions in the pledges would significantly reduce global emissions, a sizable and expanding gap exists in relation to the mitigation action required to meet the 2 °C goal. Namely, the United Nations Environment Programme (UNEP), in its *Emissions Gap Report 2013*, found that there is a need for additional emission reductions of between 8 and 12 billion tonnes of carbon dioxide equivalent (Gt CO_2 eq) by 2020 (UNEP, 2013). UNEP also described a technical mitigation potential of approximately 17 ±3 Gt CO_2 eq by 2020, with a marginal reduction cost of USD 50–100/t CO_2 eq (UNEP, 2012).

13. Aligned with the findings contained in the recent contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2014: Mitigation of Climate Change* (IPCC, 2014), the need for urgent action to close the pre-2020 ambition gap is universally recognized by Parties.[9] To that end, Parties emphasized the need for an immediate and expanded scale-up of catalytic and game-changing effort that aligns with both climate and development goals and brings untapped mitigation potential to fruition. However, significant time and effort is required to establish robust enabling frameworks and to design effective policies and actions that address barriers and ultimately ensure successful and sustainable implementation outcomes.[10]

14. Various developing country Parties continue to emphasize the need for developed country leadership in fulfilling current commitments and increasing mitigation ambition by 2020, as aligned with the objective and principles of the Convention. Also, action taken by Parties included in Annex I to the Convention to reduce emissions in line with the ranges referred to in the IPCC Fourth Assessment Report could significantly contribute to closing the pre-2020 ambition gap.[11]

[4] Adopted by Parties in 2010, the Cancun Agreements present the decision to keep the increase in global average temperature to below 2 °C (hereinafter referred to as the 2 °C goal).

[5] FCCC/SB/2011/INF.1/Rev.1.

[6] Decision 1/CMP.8, annex I.

[7] FCCC/SBI/2013/INF.12/Rev.2.

[8] FCCC/TP/2013/8.

[9] As footnote 8 above.

[10] As footnote 8 above.

[11] As footnote 8 above.

B. Explaining the logical framework used in the thematic chapters

15. The findings contained in this update of the technical paper are based on the second version of the technical paper published in 2013, which discussed thematic areas with high mitigation potential as identified in the relevant submissions, such as energy supply, EE, RE, transport (including international aviation and shipping), fossil fuel subsidy reform, short-lived climate pollutants (including fluorinated gases), land use and waste. Those areas offer many opportunities for mitigation action that could be employed and scaled up prior to 2020. Reference table 1 summarizes information on each thematic area in terms of mitigation potential and benefits, sustainable development benefits, barriers that prevent the utilization of potential, examples of national actions and information on cooperative initiatives that help to address barriers and lay a foundation for ambitious action at the national and international levels.

16. In order to continue enhancing mitigation ambition and move forward from the identification of opportunities to the implementation of actions, a logical framework emerged out of the discussion on the technical examination process launched in 2014 for unlocking mitigation potential in the pre-2020 period. That logical framework is based on the broader context related to technical mitigation potential, implementation progress, adaptation and sustainable development co-benefits, investment costs and remaining barriers to action.

17. In that context, the technical examination process aims to promote the immediate and urgent action needed to adopt, scale up and replicate robust good practices, policies and effective actions to move from discussing mitigation potential to realizing action. The technical process started with the examination of two thematic areas, namely RE and EE, as the large mitigation potential locked in RE and EE could play a major role in raising pre-2020 ambition and contribute to achieving the 2 °C goal (UNEP, 2013; IEA, 2013a; IRENA, 2013; and IPCC, 2011). The technical examination process will continue by looking at the remaining thematic areas at the TEMs organized throughout the year.

18. At the TEMs held in March 2014, when discussing opportunities, barriers and the next steps in unlocking the mitigation potential of RE and EE, Parties identified two key policy themes that are applicable to both RE and EE: strengthening institutional, legal and regulatory frameworks; and designing and implementing effective and multifaceted policy portfolios. For each portfolio in both RE and EE areas, Parties considered specific policy options and key elements of the enabling environment for successful policy replication and implementation and provided select examples of good practices (see tables 1 and 2).

19. Growth and sustainable development co-benefits provide the essential foundation for action in the areas of RE and EE. Such actions should be aligned with development priorities, economic growth and other national circumstances in order to ensure public support and sustainable outcomes. RE and EE policies can catalyse multiple sustainable development co-benefits, including: cost savings, poverty reduction, job creation, enhanced productivity and competitiveness, energy security, trade benefits associated with decreased energy imports or expanded energy exports, energy access, improved energy system stability and resilience, improved health and well-being and reductions in greenhouse gas (GHG) emissions and other pollutants, among others. To support the effective implementation of good practice mitigation policies and the rapid diffusion of EE and RE technologies, significant barriers must be addressed through national action and cooperative initiatives and partnerships. Parties emphasized the need for scaled-up financial support, capacity-building and transfer of technology and know-how to address those barriers and needs in a transparent and robust manner.

20. Cooperative initiatives continue to contribute to addressing key barriers and support the achievement of Parties' pledges and other voluntary activities to close the pre-2020 ambition

gap. Focused on various thematic areas (energy, land use, cross-cutting, etc.), they provide partnership platforms to support political dialogue, peer learning and capacity-building, policy and project implementation, and private-sector engagement to catalyse mitigation action.[12] Cooperative initiatives are focused at various levels and often support bridging the gap between national and subnational action and regional and international activities. They support emission reductions and development priorities both directly and indirectly by supporting concrete commitments as well as enabling environments and peer learning. Some developing country Parties highlighted the difficulty of directly attributing emission reductions to cooperative initiatives (given that reductions are accounted for at the national level) and, instead, emphasized their role as voluntary cooperative initiatives that support action in all countries.[13] The IPEEC and the SE4All initiatives are considered to be among the leading examples of cooperative actions aimed at enabling countries to implement RE and EE actions at the national level.

21. Non-state actors and subnational entities also contribute to supporting mitigation action. For instance, mitigation activities often occur at the subnational level and local governments are central to the planning and implementation of such work on the ground. A few examples of such actions were provided in the presentations by the C40 Cities Climate Leadership Group and Partnership on Sustainable Low Carbon Transport made during the TEM on EE as well as in the relevant submissions, but more specifically such actions will be discussed at the TEMs on urban environment to be held in June 2014. Finally, non-governmental organizations often have an important and unique understanding of local circumstances and provide crucial input to planning, ground-truthing and implementing mitigation activities.

22. Multilateral financial institutions, such as the World Bank and regional development banks, UNFCCC institutions, such as the Green Climate Fund (GCF), the Climate Technology Centre and Network (CTCN) and the Technology Executive Committee (TEC), and the Global Environment Facility (GEF) provide necessary means of financial support, as well as support to facilitate technology transfer and capacity-building and training based on their vast global experience and opportunities.

III. Renewable energy

A. Potential, progress, benefits, costs and barriers

23. The analysis of IEA (2013a) shows that meeting the 2 °C goal set by the international community is still achievable through the vastly expanded adoption and replication of energy policies, technologies and other actions that build on successes around the world. As described in the IEA 450 Scenario, targeted investment and support for actions to expand growth in wind, hydro and solar photovoltaics (PV) could lead to half of global electricity being supplied by renewables by 2035. The 450 Scenario requires significant action in the energy sector before 2020, which could result in 3.1 Gt CO_2 eq emission reductions by 2020, or approximately 80 per cent of the overall reductions needed to meet the 2 °C goal.

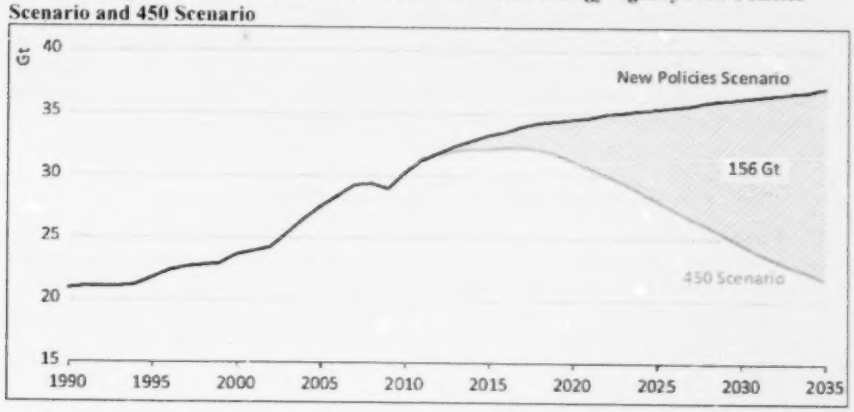
24. However, IEA (2013a) also describes the need, in order to realize such a future, for "unprecedented change" and "urgent commitment to strong action, followed by robust, unwavering implementation", as a pathway focused on current and planned policies will not be sufficient to meet the 2 °C goal. Enhancing current RE policies (aligned with the IEA New Policies Scenario) could lead to 31 per cent of global power generation coming from RE sources and 4.1 Gt CO_2 eq emission reductions by 2035 (IEA, 2013b). Figure 1 presents a comparison of the mitigation potential of the two IEA scenarios.

[12] The secretariat developed a portal on cooperative initiatives to support governments and institutions in connecting with relevant initiatives. The portal is available at <http://unfccc.int/7785>.

[13] As footnote 8 above.

Figure 1

Global energy-related emissions under the International Energy Agency New Policies Scenario and 450 Scenario



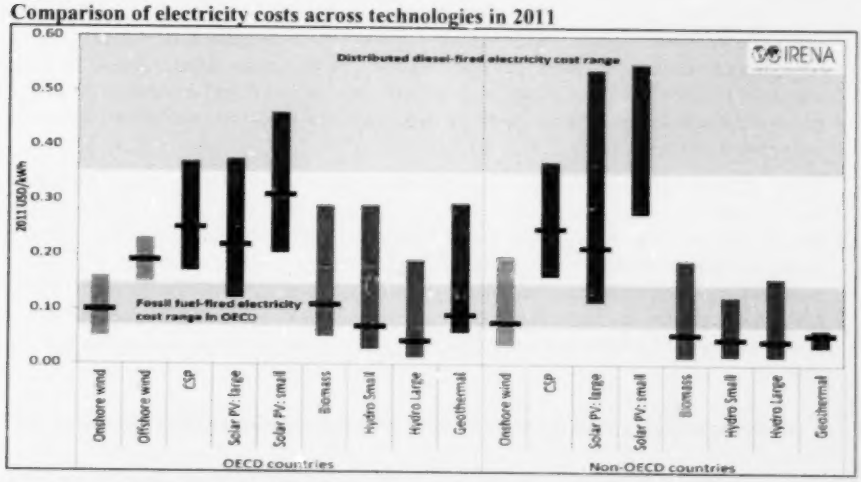
Source: International Energy Agency. 2013. *World Energy Outlook Special Report 2013: Redrawing the Energy-Climate Map*.

25. Global RE capacity continues to expand rapidly on an annual basis, with the annual average growth rates of solar PV, concentrating solar power and wind power from 2007 to 2012 being 60 per cent, 43 per cent and 25 per cent, respectively (Renewable Energy Policy Network for the 21st Century (REN21). 2013). Over half of new electricity generation capacity came from renewables in 2012 (REN21, 2013) and RE capacity has doubled in recent years (IRENA, 2013).

26. Related to the significant expansion of RE capacity, RE prices have continued to decline over time as a result of technological advances, economies of scale and component production surplus (REN21, 2013). In many cases, and as presented in figure 2, RE technologies now offer the most economic solution for new power generation capacity (IRENA, 2013).

Figure 2

Comparison of electricity costs across technologies in 2011



Source: International Renewable Energy Agency. 2013. *Renewable Energy Innovation Policy: Success Criteria and Strategies*.

Abbreviations: CSP = concentrating solar power, OECD = Organisation for Economic Co-operation and Development, PV = photovoltaic.

27. RE deployment can support key national development priorities, catalysing economic benefits related to job creation and income generation, energy security and trade balance, sustainable economic growth, cost savings and technological competitiveness and innovation. RE can also support social benefits related to poverty reduction, energy access and public health, as well as environmental benefits associated with climate change mitigation and resilience and local environmental protection. Spotlight box 1 highlights action in Ethiopia and Saudi Arabia to align mitigation action with development goals.

Spotlight box 1

Aligning action with national circumstances and development goals

Ethiopia: Ethiopia's Climate Resilient Green Economy Strategy sets the stage for renewable energy (RE)-related action and emphasizes economic growth, poverty reduction and climate change adaptation. Ethiopia seeks to move from being an agriculturally focused least developed country to a middle-income country with a flourishing industrial sector and zero net carbon emissions. To achieve those goals, Ethiopia is pursuing RE policies and actions focused on hydro, wind and geothermal development, as well as rural electrification activities to address energy access needs.[a]

Saudi Arabia: Saudi Arabia's RE priorities align closely with the country's national development goals to promote sustainable economic growth, job creation, economic diversification, adaptation and water security, among others. In that context, mitigation is considered a co-benefit of sustainable development and adaptation. To support the realization of its goals, Saudi Arabia collaborates with various institutions to assess and determine appropriate policy and technology choices that harmonize key economic drivers, RE and national development priorities.[b]

[a] *Source*: Ethiopia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

[b] *Source*: Saudi Arabia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

28. According to REN21 (2013), in most countries RE policy is driven by specific targets and 138 countries had established such RE policy targets by 2012, a 27 per cent increase since 2010 (see para. 35 below). More specifically, feed-in tariffs (FiTs), renewable portfolio standards or quota policies, and biofuel mandates have expanded in recent years, with 99 countries, states or provinces implementing FiTs, 76 with quota policies and 76 with biofuel mandates in place in 2012. Coupled with technological advances and economies of scale, such policy actions have contributed greatly to significant cost reductions and the expansion of the deployment of RE over time.

29. Despite RE-related successes, key barriers (elaborated in the addendum) still hinder the level of RE deployment and scale-up needed to reach the 2 °C goal. Common challenges include: technical barriers associated with geographical circumstances and grid reliability with the increasing integration of RE; economic barriers related to cost, finance and manufacturing; technical, policymaking, financial planning skills and capacity development needs; access to the grid and priority in dispatching RE from wind and solar power, and the need for improved access to innovative technology and information (e.g. good practices and success and failure stories).

B. Practices, policies and actions to catalyse renewable energy deployment

30. Country-level planning in relation to RE varies greatly depending on the national circumstances, reflected in technical, geographical, economic and other capacity-related

factors.[14] Therefore, there is no 'one-size-fits-all' approach to supporting RE deployment. Tailored and country-specific policy portfolios congruent with national circumstances, and designed to address key barriers, are needed to realize the potential of RE. Successes, challenges and lessons learned from successful activities can be used to inform and inspire similar actions customized to suit national contexts in other countries.

1. Policy theme: strengthening institutional, legal and regulatory frameworks

31. In the context of national circumstances as well as key economic and development drivers, Parties emphasized the need to reinforce institutional, legal and regulatory frameworks that can promote RE through comprehensive and integrated planning. Frameworks that clearly streamline the key planning and implementation stages, with a focus on transparency, accountability and broad stakeholder engagement, are crucial. Also, as RE technologies exist in a dynamic environment with cost and performance changes occurring rapidly, robust monitoring and evaluation (M&E) is a key component of integrated frameworks and supports policy iteration, adjustments and refinement over time.

32. Ministerial coordination is also critical in streamlining cross-governmental processes and decisions related to action on RE and in reducing policy overlap and duplication. In some cases, an entity dedicated to RE with a specific directive to support RE deployment can help to facilitate broader coordination, oversee actions and increase legitimacy (World Resources Institute (WRI) and World Wildlife Fund (WWF), 2013). Streamlining action on RE with broader low-emission development planning processes can also support coordinated action at the national level, as in the case of Colombia's integration of its Energy Sector (RE and EE) Action Plan with the country's Low Carbon Development Strategy.[15] Further examples of integrated and robust RE frameworks are highlighted in spotlight box 2.

Spotlight box 2
Integrated and robust renewable energy frameworks

Germany: Comprehensive energy policy framework "Energiewende" encompasses actions on renewable energy (RE) (through the Renewable Energy Sources Act), energy efficiency (through the Energy Efficiency Directive) and grid transformation (through the Power Line Development Act and Federal Requirement Plan). These policies are also integrated with and supported by the National Climate Initiative and the Market Incentive Programme. Through that three-tiered approach, Germany seeks to expand cost-efficient renewables, significantly reduce energy consumption, and support grid flexibility and RE integration. This comprehensive policy approach has led to major successes for the economy and climate.[a]

Kenya: Action on RE in Kenya is closely aligned with the country's key development goals to promote energy security, employment and income generation, improved trade balance and climate change mitigation. With an emphasis on effective intergovernmental and broader stakeholder coordination and leadership by various public and private institutions, Kenya supports RE through a number of policies and plans, such as the 2006 Energy Act, the Geothermal Resources Act and feed-in tariffs. Kenya has integrated key RE and energy efficiency related actions into its broader low-emission development planning process through its Climate Change Action Plan. Taken as a whole, Kenya's policy portfolio provides a strong institutional and political framework for RE deployment in the country.[b]

Philippines: The Philippines adopted a long-term Energy Plan that integrates RE-related actions with broader resource planning and supports key national priorities focused on energy security and sustainable development. In alignment with the Energy Plan, the Renewable Energy Act and National Renewable Energy Programme seek to triple RE

[14] ADP TEM on RE, presentation by IRENA, March 2014.
[15] ADP TEM on RE, Colombia's presentation, March 2014.

capacity to 15,304 MW by 2030. The Philippines' Renewable Energy Act is also closely aligned with the country's broader Climate Change Act and National Climate Change Action Plan for 2011–2028, supporting integrated and coordinated action across the Government.[c]

[a] *Source*: Germany's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

[b] *Source*: Kenya's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

[c] *Source*: World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets. Global lessons from the road to implementation*.

2. Policy theme: design and implementation of effective and multifaceted policy portfolios

33. Countries have implemented various policies to support RE deployment, including: RE targets and quotas; pricing policies, such as FiTs, carbon pricing and establishing price stabilization funds; fiscal incentives, such as direct RE subsidies and tax credits; and grid integration measures. Other key policies to support RE diffusion include tradable RE certificates and net metering.

34. Across policy options, Parties emphasized the need for flexible design to ensure market and technology changes inform refinements and adjustments, also requiring nimble and flexible institutions to respond to changes and ensure efficiency. To ensure broad public acceptance and support, the benefits of policies to support the scaling up of RE should be clearly and compellingly presented to stakeholders and the public to ensure sustained support and successful outcomes (WRI and WWF, 2013). Parties also highlighted the need for timely, integrated, tailored and affordable financial support, both to design and implement effective policies. Key policy options are described below in paragraphs 35–39 below and elaborated on in table 1.

35. **Renewable energy targets**: As an important element of broader RE policy portfolios, Parties emphasized the need to establish effective RE targets that send stable policy signals and support long-term deployment goals. IRENA emphasized the point that, even in the absence of other RE policies, such as FiTs, subsidies, etc., targets can still play a significant role in advancing RE deployment.[16] Successful actions to support RE targets undertaken in China, the European Union and the Marshall Islands are presented in spotlight box 3.

Spotlight box 3
Renewable energy targets

China: China expects to reach a target of 15 per cent non-fossil primary energy by 2020. To this end, China established a portfolio of laws and regulations under its Renewable Energy Law, which includes national renewable energy (RE) targets, mandatory RE grid access, electricity pricing policies and special RE funds. The law is complemented by a number of actions, including annual RE plans and goals, distributed and off-grid RE for rural areas, and pilot projects.[a]

European Union: The European Union's 2020 Climate and Energy Package sets out the 20-20-20 targets to reduce greenhouse gas emissions by 20 per cent (from the 1990 level), increase RE consumption by 20 per cent and improve energy efficiency by 20 per cent by 2020. To achieve those targets, the European Union is supporting four key legislative actions: the reform of the European Union Emissions Trading System (ETS); national targets to reduce non-ETS emissions (such as those from agriculture, housing, waste and transport); national RE targets; and carbon capture and storage.[b]

Marshall Islands: Under the National Energy Policy and to address the challenges

[16] As footnote 14 above.

associated with fossil fuel dependence, the Marshall Islands implemented its outer island solar project, setting a target of 100 per cent RE electrification. The project resulted in 95 per cent solar electrification of all outer island public facilities and households and, building on that success, the Marshall Islands has adopted a target for the rest of the island of 20 per cent RE electrification by 2020.[c]

[a] *Source*: China's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

[b] *Source*: See <http://ec.europa.eu/clima/policies/package/index_en.htm>.

[c] *Source*: The Marshall Islands' presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

36. **Feed-in tariffs**: Many countries have adopted FiTs to support RE deployment, often in combination with other RE policies, such as tax incentives and RE quotas, which are generation-based, quantity-driven policy instruments. To be successful, FiTs must complement existing policies and take into account various national drivers and support high-level policy goals (UNEP, 2012). The funding of FiTs is also an area of critical importance, especially in developing countries. The Third World Network has proposed a globally funded programme, under the What Next Forum, to support the design and implementation of FiTs in developing countries. The proposal presents a structure to finance the programme under the GCF in partnership with a number of implementing agencies.[17]

37. **Tax incentives**: Tax incentives, including industry, production, personal, property and sales tax credits and deductions, accelerated depreciation and income tax holidays for the first few years can help to reduce the burden of the high upfront capital costs of RE projects and should be aligned with higher-level RE goals and available financial resources. In addition, tax incentives can reduce overall investment risk and support the uptake of new RE technologies. They can also make RE sources competitive as compared with other sources of energy, which have been subsidized. As technologies become more commercially viable, incentives can be reduced and ultimately phased out over time (Renewable Energy and Energy Efficiency Partnership, 2010).

38. **Renewable energy grid integration measures**: Countries are adopting a number of actions and policies to ensure grid stability, flexibility and resilience with the increasing integration of RE. Grid integration and access measures should be integrated within broader RE frameworks, as early planning for grid integration infrastructure and technical requirements, such as transmission and distribution needs, forecasting and storage technologies, etc., can help to ensure long-term sustainable outcomes (Cochran et al., 2012).

39. Several policy options as well as key elements of the enabling environment to support successful policy replication and implementation, as well as some country-specific examples are highlighted in table 1. A few notable policies described during the TEMs are highlighted in spotlight box 4.

Spotlight box 4
Innovative renewable energy policies

Germany: Under Germany's Renewable Energy (RE) Sources Act, RE is guaranteed grid access and given priority for transmission and distribution. Grid access is supported by technology-specific 20-year feed-in tariffs, with grid operators equalizing additional costs associated with RE electricity across all electricity consumers (excluding energy-intensive industries). Given the success of the Renewable Energy Sources Act, Germany highlighted electricity system volatility as a major challenge for the future, as RE is expected to meet nearly 100 per cent of electricity demand by 2022. To address that challenge, Germany is investing in innovative measures to increase flexibility in electricity system supply and

[17] ADP TEM on RE, presentation by the What Next Forum, March 2014.

demand, as elaborated on in the addendum.[a]

United Kingdom of Great Britain and Northern Ireland: The United Kingdom established an innovative pricing mechanism called Contracts for Difference (CfD) to reduce investment risk associated with RE projects by providing greater stability and certainty in relation to revenue. The mechanism allows RE generators to receive a fixed or 'strike' price for RE electricity production. Under that approach, revenues are stabilized within a predetermined range for the period of the contract and when the electricity market price is higher or lower than the strike price the generator either receives the difference in payment or pays back the difference. The CfD structure increases efficiency by addressing market issues associated with bidding electricity when market prices are negative and supports revenue certainty for the generator, thus addressing key economic barriers to RE deployment, as elaborated on in the addendum.[b]

United States of America: The United States is seeking to expand clean energy electricity to 80 per cent of energy generated and to increase the cost-competitiveness of RE technologies. Solar power in the United States has experienced notable success, with an approximately 60 per cent annual growth rate and an 80 per cent reduction in price over the last four years, providing broad benefits to the global community. The United States Department of Energy's SunShot Initiative is a major contributor to such success. Specifically, the programme supports research and development in relation to solar photovoltaics and concentrating solar polar, systems and grid integration analysis, technology development and advancing innovations in domestic manufacturing. Since 2011 the price of solar power has dropped from 21 cents to 11 cents/kWh and SunShot has a goal of continuing to reduce the price of solar electricity to 6 cents/kWh by 2020.[c]

[a] *Source*: Germany's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

[b] *Sources*: The United Kingdom's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014; and Department of Energy & Climate Change. 2012. *Annex: Feed-in Tariff with Contracts for Difference: Operational Framework*.

[c] *Source*: The United States' presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

Table 1

Renewable energy policy menu (for select policy options and examples highlighted during the technical expert meetings and in relevant submissions)

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
Policy option: High-level policy frameworks and integrated action plans	
• **Establish integrated, transparent and stakeholder-driven approaches**, including: setting a vision and objectives; assessing resources and potential; identifying barriers; establishing targets; evaluating, designing and implementing policies and actions; and reviewing and refining the overall process, policies and actions • **Iterate and refine** policies and actions to ensure learning and good practices are captured and weaknesses are addressed • **Support coordination** to streamline cross-governmental processes and decisions related to action on renewable energy (RE) and reduce policy overlap and duplication • **Consider an agency dedicated to RE** to support RE deployment by facilitating broader coordination, overseeing actions and increasing legitimacy • **Monitor and evaluate** RE-related actions within broader frameworks to support improvements over time and attract	• China – Comprehensive Workplan for Energy Conservation and Emission Reduction during its Twelfth Five-Year Plan period • Colombia – Low Carbon Development Strategy • European Union –Climate and Energy Package • Indonesia – National Action Plan for Reducing Green House Gas Emissions • Kenya – National Climate Change Action Plan for 2013–2017 • Philippines – Climate Change Act and National Climate Change Action Plan for

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
international finance	2011–2028 • United Kingdom – Low Carbon Transition Plan: National strategy for climate and energy • United States – The President's Climate Action Plan
Policy option: RE targets (quotas and renewable portfolio standards)[a, b]	
• **Engage stakeholders** to support initial target design and plan for regular consultation and feedback • **Determine policy goals and analyse and model policy impacts** to ensure goals are met on the basis of resource availability, transmission and distribution, siting considerations and complementary policies (at the national and subnational levels) • **Identify technologies to be included in the policy** by assessing social impacts, determining which technologies are proven, but not yet widely deployed, and defining geographical territories for inclusion and treatment of central and distributed generation • **Set effective and achievable targets** by including eligible technologies, developing tiers for higher-cost technologies, establishing a time frame that supports long-term finance and contracting, rather than relying primarily on short-term RE certificate markets, and monitoring compliance by providing clear guidance on accounting systems and payments, as well as a system to redistribute non-compliance payments (e.g. an RE Fund) • **Establish a tradable Renewable Energy Credits (REC) system** to support flexibility and market-based approaches for compliance. REC systems can also reduce compliance and administrative costs and simplify verification processes • **Other enabling actions** include: verifying available resources through detailed geospatial and resource assessments; ensuring transmission access for RE; and establishing complementary mechanisms to support finance, such as power purchase agreements and other contractual arrangements for project finance	• China – 20 per cent share of RE in electricity production by 2015 • European Union – 20-20-20 targets • Germany – at least a 35 per cent share of RE in electricity production by 2020 • India – 17 per cent share of RE in electricity production by 2017 • Marshall Islands – 100 per cent RE electrification for outer island and 20 per cent RE electrification for whole island • Morocco – 42 per cent share of RE in electricity production by 2020 • Philippines – 40 per cent share of RE in electricity production by 2020 • South Africa – 30 per cent share of RE in electricity production by 2020 • Spain – 38 per cent share of RE in electricity production by 2020
Policy option: Feed-in tariffs (FiTs)[c]	
• **Conduct robust analyses** to ensure policy aligns with and meets overall goals (e.g. rapid RE deployment to meet targets, emission reduction, job creation, minimizing policy cost, etc.), especially given complexity associated with design of FiTs • **Design effective policies** by: basing payments on cost of RE generation and setting tariff prices in relation to technology, location, resource availability and size of the project; guaranteeing RE access to the grid; including eligibility for all project developers and end-users; ensuring electricity generated has a 'must-take' provision; and supporting the stability of the long term policy • **Determine approach to financing FiT**; some options include: integrating costs directly with the electricity rate; use of tax revenues; a combination of the two aforementioned options; and leveraging carbon auction revenues. Cost sharing is another important consideration and spreading costs across utilities and regions can support efficient outcomes • **Ensure policy flexibility, as well as predictable and gradual adjustments** in relation to advancements in technology, evolving	• Germany – Renewable Energy Sources Act – technology-specific 20-year FiTs • Kenya –FiT regime for geothermal, wind, small hydro, biomass, biogas and solar-generated electricity • United Kingdom – Contracts for Difference • Various state FiTs in the United States (Hawaii, Vermont, California, etc.)

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
markets, and other considerations that often require adjustments to the short-term FiT payment level and assessment of the long-term programme design. Leadership by policymakers is often integral to ensuring the flexibility and overall efficiency of the policy. However, policy adjustments should be incremental and predictable and avoid volatility or quick reactions.	
Policy option: Tax incentives (industry/production, personal, property and sales)[a, d]	
• **Strong political leadership** is required to communicate to the public the broader economic development benefits associated with tax incentives (e.g. jobs, new enterprises, etc.), given tax revenue implications • **Design of tax incentives** should: ensure that the size of the incentive is adequate to attract private-sector interest, but not overly burdensome on the tax revenue base; have a long enough time-horizon to provide a significant market signal, but also be flexible in supporting reductions over time; include consumer education and marketing approaches related to return on investment; and include the development of a plan to review the effectiveness of the tax incentive programme	• Cameroon – removal of value-added tax for RE technologies • India – removal of import taxes for concentrating solar power technologies • Ireland – corporate tax deductions for investment in RE • Nicaragua – tax exemption for carbon bond sales and for RE operations (five-year maximum) • United States – Production Tax Credit
Policy option: RE grid integration measures[e, f]	
• **Facilitate and ensure public engagement** to inform grid integration actions, with an emphasis on engagement for planning new transmission taking into account overall grid expansion objectives and distribution of costs and benefits; siting locations (stakeholders can provide valuable information that could affect RE siting but may not be included in public records); transmission routing options; regulatory approach associated with projects; and expansion, among many other possible areas of interest • **Integrate processes to ensure planning efficiency across the grid network** to streamline transmission, generation and system actions. At the geographical level, subnational institutions (local and regional) often have grid planning processes that can be built upon to ensure coordination and integration across various actors and locations • **Consider increasing RE resource area through** grid extension to access remote and diverse RE resources, and expanding energy trade opportunities can help to address resource variability constraints • **Enhance power system operations** through actions such as adapting dispatch rules for the market and power plant to accommodate increasing RE integration and adopting advanced forecasting methods • **Support system flexibility** through actions such as: reforming scheduling and dispatch intervals to occur subhourly; designing capacity markets where there are issues related to decreases in wholesale electricity prices; and implementing zonal or nodal pricing schemes that can address congestion issues and support new resource development, among many others. In addition, storage, demand response and smart grid options can further support flexibility through shifting load, balancing and frequency measures	• Germany – grid integration actions under the Renewable Energy Sources Act • Mexico – engagement in 21st Century Power Partnership under the Clean Energy Ministerial • South Africa – engagement in 21st Century Power Partnership under the Clean Energy Ministerial • United States – systems and grid integration analysis under the SunShot Initiative

Note: This policy menu should be complemented by the information on cooperative initiatives presented in box 2 and information on additional initiatives presented on the portal on cooperative initiatives, which is available at

<http://unfccc.int/focus/mitigation/items/7785.php>.

[a] *Source*: Renewable Energy and Energy Efficiency Partnership, Alliance to Save Energy and American Council On Renewable Energy. 2010. *Compendium of Best Practices: Sharing local and state successes in energy efficiency and renewable energy from the United States*.

[b] *Source*: Various examples drawn from World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.

[c] *Sources*: Cochran J, Bird L, Heeter J and Arent D. 2012. *Integrating Variable Renewable Energy in Electric Power Markets: Best Practices from International Experience*. National Renewable Energy Laboratory, Joint Institute for Strategic Energy Analysis, Clean Energy Solutions Center and Clean Energy Ministerial; and Couture T, Cory K, Kreycik C and Williams E. 2010. *A Policymaker's Guide to Feed-in-Tariff Policy Design*. National Renewable Energy Laboratory.

[d] *Source*: Renewable Energy Network 21. 2013. *Renewables 2013 Global Status Report*.

[e] *Source*: Key actions adapted from Cochran J, Bird L, Heeter J and Arent D. 2012. *Integrating Variable Renewable Energy in Electric Power Markets: Best Practices from International Experience*. National Renewable Energy Laboratory, Joint Institute for Strategic Energy Analysis, Clean Energy Solutions Center and Clean Energy Ministerial.

[f] *Source*: International Energy Agency. 2013. *World Energy Outlook 2013*.

IV. Energy efficiency

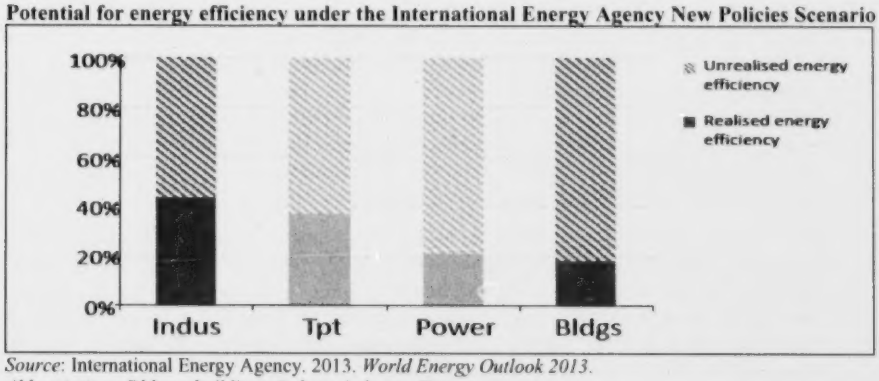
A. Potential, progress, benefits, costs and barriers

40. In its 450 Scenario, as referred to in paragraph 23 above, IEA (2013a) estimates that by 2020 action on EE could lead to approximately 1.5 Gt CO_2 eq emission reductions, or approximately half of the emission reductions under the 450 Scenario. The UNEP *Emissions Gap Report 2013* (UNEP, 2013) also found that significant EE-related actions could result in emission savings of approximately 2 Gt CO_2 eq per year by 2020, with action focused on buildings (accounting for 0.6 Gt CO_2 eq per year), removal of incandescent light bulbs (accounting for 0.5 Gt CO_2 eq), energy-efficient electrical appliances (0.6 Gt CO_2 eq) and vehicle efficiency improvements (0.7 Gt CO_2 eq) (Blok et al., 2012).

41. Given the often low or negative net costs and short payback periods, EE-related actions are widely seen as low-hanging fruit when compared with other mitigation options (IEA, 2013a). Generally, technologies with a three- to four-year payback period can achieve around 30 per cent energy savings (International Institute for Applied Systems Analysis, 2012; and UN-Energy, 2009). There is significant potential to expand EE-related action and capture those cost benefits, as two thirds of the economic potential of EE (up to 2035) remains unrealized (IEA, 2013b) (see figure 3). Scaled-up investment in EE-related action could also greatly benefit the global economy, supporting a possible increase of USD 18 trillion in cumulative global economic output by 2035 (IEA, 2012).

Figure 3

Potential for energy efficiency under the International Energy Agency New Policies Scenario



Source: International Energy Agency. 2013. *World Energy Outlook 2013*.
Abbreviations: Bldgs = buildings, Indus = industry, Tpt = transport.

42. Alignment with national development goals is a critical component of planning for EE-related action. EE can induce various benefits beyond energy savings, including: cost savings associated with electricity and fuel expenditure; energy security; trade benefits associated with decreased energy imports or expanded energy exports; economic development and job creation; diversion of investment to other sectors as a result of energy savings; improved energy system stability and resilience; improvements in health and well-being; and reductions in GHG emissions and other pollutants, among others.

Spotlight box 5

Comprehensive national energy efficiency policy framework

Colombia: The Colombian National Development Plan highlights the need for environmentally sustainable energy provision to support economic development. Aligned with that, Colombia's comprehensive energy efficiency (EE) policy supports EE-related actions in the residential, industrial, transport, commercial and public sectors. These actions are closely aligned with the country's Low Carbon Development Strategy and, specifically, the Sectoral Mitigation Action Plan for the electricity sector. This close coordination helps to facilitate cross-ministerial and collaborative support for EE-relation action and to ensure alignment with the country's broader development and climate goals.[a]

Japan: Oil crises in the 1970s led Japan to take significant action on energy efficiency (EE), resulting in a 40 per cent improvement in EE (based on primary energy use per unit of gross domestic product) and making Japan a global leader in EE. Japan's Energy Conservation Policy (presented in the graphic below) provides a strong example of a comprehensive set of actions to support EE, combining regulatory and incentive-based measures. The private sector is central to the framework, as policies are designed to ensure business action through minimum energy performance standards, namely the Top Runner Program, requirements to designate energy managers, and regular reporting, among other actions. Peer pressure among private entities has also played a major role in supporting successful outcomes.[b]

[a] *Source*: Colombia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

[b] *Source*: Japan's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

43. To fully realize the potential of EE improvements, there are several key barriers to action, relating to: the need for greater emphasis on EE as a key priority at the national policy level; the need for cost-reflective energy pricing; consumer behaviour often leading to short-sighted purchasing and investment patterns; lack of information and awareness of the benefits of EE; finance mobilization constraints associated with high project development and upfront capital costs as well as the perceived risk associated with EE technologies; the need for price support, other tariff mechanisms and market organization reform (to address issues associated with masking the real cost of energy and thereby reducing the incentive for EE-related action); constraints on human capacity to support EE-related action, for example for initial data collection, analysis of costs and benefits of opportunities for EE, planning (economy-wide and sectoral), designing and implementing effective policies and mobilizing finance; and the need for the further development and dissemination of best practices and techniques to support EE deployment, among others, as elaborated on in the addendum.

44. Successful and innovative actions to support the diffusion of EE technologies are occurring around the world and a number of high-quality examples were highlighted during the TEMs and in the relevant submissions. The replication of successes offers much promise and participants emphasized the need to share successes, challenges and lessons learned from countries' experiences to support such replication. Some policies to address the above-mentioned barriers are presented in spotlight box 6.

Spotlight box 6

Successful energy efficiency policies in various sectors

Denmark: The Danish Ministry of Climate, Energy and Building collaborated with trade associations that encompass over 450 energy distribution companies (including oil, natural gas, heating and electricity) to negotiate a pact that establishes a national annual energy savings goal of approximately 3,000 GWh for 2014 and 3,400 GWh for 2015 (an increase of 75 per cent on a previous agreement). Under the pact, each sector is allocated a share of the reduction obligations, which are then distributed to trade association member companies on the basis of market share. When companies reduce energy use (through financial or technical support), they receive credit for the energy savings, which can then be sold to other companies. The national energy saving goals associated with the programme have been exceeded every year since 2007. The programme has also spurred the development of a number of energy servicing companies to support energy savings. Key factors contributing to the success of the programme include:

- Cost-neutrality for the utilities involved, as spending on energy savings is passed along to the customer through tariffs, sending a price signal associated with EE;
- Flexibility for sectors to meet targets at the aggregate level in the most efficient way, meaning that there are no requirements for energy savings at the company, just at the sector level.[a]

India: India's Energy Conservation Act, established in 2001, and the National Action Plan for Climate Change (2008) both encompass action on EE, including: the establishment of a Bureau of Energy Efficiency; standards and labelling for appliances; energy-use reporting and norms for energy-intensive industries; EE building codes and the certification of energy managers; and a mandate to support market-based mechanisms for EE. India's standards and labelling programme was successful in creating a 'brand' for EE appliances that were seen as 'superior'. Key areas that contributed to the success of the programme included: assertive marketing that was ultimately adopted by manufacturers; combining mandatory and voluntary labelling approaches; regular adjustment/tightening of standards associated with labels to ensure progress; testing of labelled products; and choosing appropriate products to label in relation to the payback period, given that appliances with payback periods of longer than five years are often not successfully marketed through labelling programmes.[b]

Singapore: Singapore developed a Green Building Master Plan, with the goal of 80 per cent 'Green Mark' certification of buildings by 2030. The initiative certifies buildings in relation to energy and water efficiency, indoor environmental quality, green space integration and the use of eco-friendly materials for construction, and emphasizes high standards for measurement and verification. The programme has already exceeded the target for 2014, with more than 25 per cent of buildings expected to be certified by the end of 2014, making Singapore a global leader in green building certification. In addition to building certification, Singapore has regulations in place for energy consumption in buildings and mandates regular energy audits. It also engages in a number of international initiatives to support the transformation of EE.[c]

[a] *Sources*: Denmark's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014 and Danish Energy Agency. 2010. *Why obligation schemes are the solution for European member states during the financial crisis*.

[b] *Source*: India's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

[c] *Source*: Singapore's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

B. Practices, policies and actions to catalyse energy efficiency improvements

45. To move from discussing the potential for EE improvements to realizing action, Parties emphasized two broader policy themes, such as strengthening institutional, legal and regulatory frameworks and the design and implementation of effective and multifaceted policy portfolios. Significantly scaling up EE-related action must be a key high-level policy priority, with government leadership playing an integral role in promoting EE at all levels. Multifaceted policy portfolios are necessary to ensure economy-wide and robust action. The aforementioned higher-level policy themes are highlighted in this chapter and elaborated on in the addendum.

1. Policy theme: strengthening institutional, legal and regulatory frameworks

46. Public-sector stakeholders, crucial for EE-related action, are often dispersed throughout the government within different ministries and entities, creating a need for consistent and transparent coordination. Effective coordination can support the replication of successful action on EE across government agencies, as well as the integration and capture of synergies across related initiatives, for example across EE, climate change and low-emission development programmes. To complement activities to address barriers to EE, Parties noted the need to increase government interest in promoting EE relative to other supply options to ensure equilibrium between supply and demand through demand-side management. Also, effective coordination between ministries engaged in EE-related action as well as partnership and collaboration between national and subnational governments and the public and private sectors are critical components for success.

47. The private sector and consumers are the real action takers when it comes to mitigation through EE improvements. If they did not respond to policy initiatives, none of the policies would work at all. With regard to lifestyle, behaviour and culture have a considerable influence on energy use and the associated emissions, in particular when complementing technological and structural change in some sectors with high mitigation potential. Emissions can be substantially lowered through changes in consumption patterns (e.g. mobility demand and mode, energy use in households and the choice of longer-lasting products) (IPCC, 2014).

48. While the private sector has a key role to play in implementing EE-related activities, the public sector plays an equally important role in promoting EE by designing policies and developing incentives for private-sector uptake. Building on public and private leadership, broader EE frameworks that combine policy, regulatory and financial actions from the long-term perspective are necessary to create an enabling environment for the significant diffusion of EE technologies and measures. Diverse stakeholder engagement in and input to the development of such policy frameworks is crucial to ensure broad support and sustainable outcomes.

49. As part of a broader institutional framework for EE, Parties emphasized the need for regular M&E of EE-related actions and initiatives under way to inform the prioritization of EE programmes, policy iteration and improvements over time. As a prerequisite for effective M&E, the collection of data on energy use is required at the national and sectoral levels to support benchmarking and other M&E processes. As noted by India, the benchmarking of energy-use patterns and technology performance must occur at the country level and in relation to local circumstances.[18] M&E is also crucial to ensure compliance with EE policies and regulations. However, M&E of EE policies can be very challenging and may require international support to ensure that investors do not feel overwhelmed in relation to M&E requirements and processes.[19]

[18] ADP TEM on EE, India's presentation, 2014.
[19] ADP TEM on EE, presentation by UNEP, 2014.

2. Policy theme: designing and implementing effective and multifaceted policy portfolios

50. Rather than depending on one 'silver bullet', Parties emphasized the need for EE policy portfolios that integrate various actions, such as: standards and labelling; incentives and financial support; pricing policies; research and development initiatives, etc. Key policy measures are described below and in table 2, while successful policies, which combine various actions, are highlighted in spotlight boxes 5 and 6.

51. **Standards and labelling**: More than 75 countries currently have EE standards and labelling (S&L) programmes in place (Collaborative Labeling and Appliance Standards Programme (CLASP), 2011). Delegates emphasized the need for the scaling up of such programmes to support the rapid deployment of EE technologies. As presented in spotlight box 6, India introduced a voluntary labelling initiative and emphasized the importance of robust marketing and outreach to raise public awareness of the benefits and 'superiority' of energy-efficient appliances, which contributed to the success of its programme.[20] Building on that point, in order to complement S&L programmes, a number of TEM participants emphasized their support for forums, seminars and other learning initiatives and marketing campaigns to raise consumer awareness of the benefits of EE. UNEP found that support for efficient appliances and equipment through S&L programmes and other actions could potentially result in 1.25 Gt CO_2 eq annual emission savings globally.[21] Drawing on research conducted by CLASP and, specifically, successful activities carried out in Ghana, key actions to support the successful replication and implementation of S&L programmes are highlighted in table 2.

52. **Minimum energy performance standards**: TEM participants specifically highlighted the design and implementation of minimum energy performance standards for buildings, appliances and vehicles as a key policy action to support EE. Notable examples include: Japan's Top Runner Program, described in spotlight box 5 and the addendum; support for various programmes to phase out incandescent light bulbs through the UNEP en.lighten initiative; the phase out and replacement of inefficient power and heating technologies; and various measures to support fuel efficiency standards.

53. **Building energy codes:** According to the IPCC (2014), in 2010 the building sector accounted for around 32 per cent of global final energy use and 8.8 Gt CO_2 eq emissions, including direct and indirect emissions, with energy demand projected to approximately double and CO_2 emissions to increase by 50 to 150 per cent by the middle of the century in baseline scenarios. To address such issues, building energy codes have been adopted in a number of countries (IPCC, 2014). It is also important to note that EE and RE are closely linked in the building sector, as solar PV, solar water heaters, biomass, biogas, geothermal, etc. can play a critical role in energy-efficient building design.

54. **Fuel efficiency standards:** In relation to fuel efficiency standards, the Global Fuel Economy Initiative (GFEI) set a target to reduce fuel consumption by half by 2050. Meeting that target could lead to a stabilization of global CO_2 emissions from light vehicles, even with the projected number of vehicles expected to double during that time period.[22] Also, UNEP noted that reducing vehicle fuel consumption by 50 per cent could lead to more than USD 300 billion in annual oil import bill savings by 2025 and USD 600 billion by 2050.[23] TEM participants and relevant submissions described the good practices to support fuel efficiency presented in table 2.

55. **Efficient lighting**: According to UNEP, potential global emission benefits related to lighting standards and phase-out programmes could lead to a reduction of 490 Mt CO_2 eq

[20] As footnote 18 above.
[21] As footnote 19 above.
[22] ADP TEM on RE, presentation by the What Next Forum, 2014.
[23] As footnote 19 above.

emissions annually (assuming all inefficient light bulbs are replaced globally).[24] Lighting programmes are also very cost-effective. For instance, and as described by UNEP, a country similar to India could save approximately USD 2.6 billion through electricity savings (with a nine-month payback period) if energy-efficient lighting programmes were fully implemented in all sectors.[25]

56. **Incentives and subsidies**: Despite the economic feasibility of many investments in EE, further financial incentives are required to ensure the widespread diffusion of technologies. For instance, India noted that payback periods of two to five years for EE technologies are most effective at voluntarily attracting consumer uptake, while payback periods of beyond five years often require further incentives. Examples of financial incentives include rebates and discounts for the purchase of appliances, vehicles and buildings; while non-financial incentives may include technical assistance, training and information dissemination (United States Environmental Protection Agency, 2010).

57. **Pricing policies**: Price signals play a key role in encouraging the uptake of EE technologies and practices by consumers. Emissions trading and carbon tax policies that integrate a price for CO_2 emissions, as well as unsubsidized energy prices, can greatly encourage EE-related action. China has implemented a number of subnational actions to support carbon markets that are also expected to benefit the expansion of EE.[26] The trading of EE white certificates associated with energy saving obligations is another innovative measure to send price signals associated with EE through market-based transactions. Spotlight box 7 highlights an energy obligation trading system in Denmark and factors for success and good practices that have been observed.

58. **Research and development**: Parties noted that, despite the market success of a number of energy-efficient technologies, there is still a need for further innovative research and development of new and improved products, especially products that are tailored to national circumstances. Japan is currently supporting the research and development of high-performance heat pumps, among other technologies.[27]

59. Drawing on information from the TEM and relevant submissions, table 2 presents policy options to address barriers to EE, as well as key actions to support successful policy replication and implementation and country-specific policy examples. The table also provides information on programmes and resources to support policy design and implementation.

Table 2

Energy efficiency policy menu (for select policy options and examples highlighted during the technical expert meetings and in the relevant submissions)

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select policy country-specific examples*
Policy option: Standards and labelling (S&L) programmes[a]	
• **Identify available resources**: Designated entities must explore the availability of the necessary resources for programme design, including: legal resources (such as mandates and an authorized agency to implement an S&L programme); financial resources (budget and good practices from other countries that can be leveraged to reduce programme development costs); human resources (staff and training needs for technical and market analysis, development of standards, designing and implementing communication strategies, etc.); facilities (central office, test labs and field offices for monitoring and enforcement); and a managing institution to	• China – Energy Label scheme • European Union – Ecodesign Directive • Ghana – energy efficiency S&L programme • India – S&L programme • Japan – Energy Saving Labelling System

[24] As footnote 19 above.

[25] Submission made by UNEP under ADP workstream 2 in 2014.

[26] As footnote 8 above.

[27] ADP TEM on EE, Japan's presentation, 2014.

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select policy country-specific examples*
implement and oversee the programme • **Regional harmonization**: Implementers may also want to consider harmonizing S&L programmes at the regional level at this point in the planning process • **Collect market data**: Implementers should begin to collect key market data at this stage, including projected market trends, new technologies, performance data, etc. • **Determine policy approach**: Various options related to the policy approach should be considered, including: mandatory vs. voluntary programmes; standards vs. labels; endorsement vs. comparative labels, etc. • **Product selection**: Products should also be selected at this stage on the basis of criteria such as energy use, cost, greenhouse gas mitigation potential, etc. • **Ensure testing capabilities**: Test procedures can be developed on the basis of international good practices and should occur at accredited institutions. They should also be inexpensive, repeatable and accurate • **Assess and establish standards**: When establishing standards, it is important to ensure the affordability of efficient products, to determine the best approach to incentivize businesses to produce and support the products, and to understand how standards might have an impact on different income groups • **Raise awareness through a communications campaign**: Communication campaigns complement and support the success of S&L programmes by raising consumer awareness of the benefits of energy efficiency (EE) associated with products included in the S&L programme • **Monitor, report and evaluate**: This helps to ensure compliance and provides a mechanism to assess programme outcomes and to redesign the programme over time as needed	• United States – ENERGY STAR programme
Policy option: Energy performance standards (EPS) and obligations (including trading schemes)[b, c]	
• **Engage multiple stakeholders in developing performance standards (particularly the private sector)**: Processes to design standards should involve the active engagement of the private sector and other stakeholders to ensure industry and other needs and interests are considered and addressed. In many cases, the private sector can also support governments in better understanding customer needs in relation to standards. Technical expert groups can also be formed to consider policy, regulation and finance, quality and environmental issues in greater detail and to inform the design of standards • **Support long-term action and flexibility**: EPS design should take a long-term and flexible perspective that allows for the increasing rigour of standards over time. This allows the private sector sufficient time to make adjustments to meet standards and reduces risk associated with policy uncertainty • **Communicate the benefits**: EPS programmes should be coupled with effective communication campaigns to raise awareness of the economic, environmental and social benefits of related EE improvements • **Ensure technology and product neutrality:** Policymakers should avoid picking winners in relation to standards, instead allowing for private-sector competition in meeting the standard in the most efficient manner	• Denmark – Energy Reduction Obligation and trading mechanism • India – Perform, Achieve and Trade scheme • Japan – Top Runner Program
Policy option: Building standards and codes[d, e]	
• **Establish an effective governance and institutional structure** • **Establish local leadership** and dedicated staff to support the	• Denmark – building codes • France – 2012 Building Energy

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select policy country-specific examples*
implementation of codes • **Design and implement a long-term training strategy** for building designers and architects, contractors and construction workers to meet building codes • **Establish achievable codes** in relation to locally available building materials • **Adopt tools and services** to streamline inspection and permit processes • **Design and implement awareness campaigns** • **Evaluate the programme regularly** to support improvements and adopt emerging good practices	Code for New Buildings • India – EE building codes • Netherlands – investor payback schemes for refurbishment of rented buildings by landlords • Singapore – Building Control Act and Green Mark Scheme • Tunisia – Building Energy Code and Labelling Scheme
Policy option: Fuel efficiency standards[f]	
• **Improve and share information**: It is crucial to support information provision and experience sharing on the design and implementation of fuel efficiency actions and policies with policymakers. Information on fuel consumption and associated CO_2 emissions provided to consumers should be improved to support informed decision-making • **Set standards and design fiscal policy**: Regulatory standards for fuel consumption or CO_2 emissions send a clear signal and provide certainty to the private sector and consumers on the viability of investments. Vehicle taxes can be designed in relation to fuel economy or CO_2 emissions to support consumer uptake of energy-efficient vehicles • **Engage the private sector**: Working closely with the private sector in designing fuel efficiency programmes can support successful outcome	• Brazil – fuel economy standard • Canada – greenhouse gas (GHG) standard • European Union – CO_2 standard • Japan – Top Runner Program • Mexico – fuel economy/GHG standard • South Korea – fuel economy/GHG standard
Policy option: Lighting measures[g]	
• **Establish national regional governance and leadership**: It is important to develop strategies for efficient lighting at both the national and regional levels to ensure high-level political support and coordination across relevant entities. Strategies can include standards, labels and quality control approaches, which can be harmonized at the regional level. Successful programmes are also supported by robust education and public-awareness initiatives. Integrating lighting technology road maps at the national and regional levels can help to support technology transfer • **Strengthen technical capacities**: The training of government staff to support programme implementation may be necessary, as well as measures to enhance monitoring and enforcement processes and capacities. Training and investment to support the establishment of collection and recycling programmes may be necessary • **Design financial incentives**: Financial incentives and other fiscal mechanisms may be necessary to support the uptake of efficient lighting technologies	• Colombia – replacement of incandescent light bulbs under the Programme on Rational and Efficient Use of Energy and other Forms of Non-Conventional Energy • Ghana – incandescent light bulb phase-out programme
Policy option: Incentives and subsidies[d, h]	
• **Strong political leadership** is required to communicate to the public the broader economic development benefits associated with tax incentives (e.g. jobs, new enterprises, etc.), given the tax revenue implications • **The design of tax incentives** should: ensure that the size of the incentive is adequate to attract private-sector interest, but not overly burdensome on the tax revenue base; have a long enough time-horizon to provide a significant market signal, but also be flexible in supporting reductions over time; include consumer education and marketing approaches related to return on investment; and include the development of a plan to review the effectiveness of the tax incentive programme	• Japan – tax incentives for facilities, buildings and automobiles and subsidies for facility purchasing and interest payments • Netherlands – Accelerated Depreciation of Environmental Investments Measure • South Africa – Section 121 Tax Allowance for manufacturing

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select policy country-specific examples*
	projects • United States – home, vehicle and appliance efficiency tax credits

Note: This policy menu should be complemented by the information on cooperative initiatives presented in box 2 and the information on additional initiatives presented on the portal on cooperative initiatives, which is available at <http://unfccc.int/focus/mitigation/items/7785.php>.

[a] *Source*: Information adapted from Collaborative Labelling and Appliance Standards Programme. 2011. *Standards and Labels: Transforming the Market for Energy Efficient Appliances*.

[b] *Source*: Regulatory Assistance Project. 2012. *Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes*.

[c] *Source*: Consumer Federation of America. 2013. *Energy efficiency performance standards*.

[d] *Source*: Renewable Energy and Energy Efficiency Partnership, Alliance to Save Energy and American Council on Renewable Energy. 2010. *Compendium of Best Practices: Sharing local and state successes in energy efficiency and renewable energy from the United States*.

[e] *Source*: International Energy Agency. 2008. *Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings*.

[f] *Source*: Global Fuel Energy Initiative. 2010. *Fuel Economy State of the World 2014: The World is Shifting into Gear on Fuel Economy*.

[g] *Source*: Adapted from the submission made by the United Nations Environment Programme under workstream 2 of the Ad Hoc Working Group on the Durban Platform on Enhanced Action in 2014.

[h] *Source*: See <http://www.kpmg.com/global/en/issuesandinsights/articlespublications/green-tax/pages/energy-efficiency.aspx>.

V. Means of support to enhance the deployment of renewable energy and energy efficiency improvements in developing country Parties

60. Access to capital, technology transfer and capacity-building are vitally important to significantly scale up the adoption and deployment of EE and RE technologies and actions. Support efforts that are scalable, replicable and innovative and leverage complementary funding sources lead to the most effective and successful outcomes.[28] Also, Parties noted the need to integrate support areas (i.e. financial, technology transfer and capacity-building) within a comprehensive approach to facilitate collaboration and dialogue between governments and support institutions on the most effective mechanisms to realize enabling environments for RE and EE.

A. Access to financial resources

61. RE-related investment activity shifted prominently to developing countries in 2012, making up 46 per cent of total new investment in RE (USD 112 billion, an increase of 34 per cent since 2011). In total, solar power received the greatest share of new investment in 2012 (57 per cent, or USD 140.4 billion), followed by wind (USD 80.3 billion) and hydro (USD 33 billion) (REN21, 2013). However, despite those investment trends, there are still significant gaps in the support required to ensure large-scale RE deployment, especially in developing countries. According to IEA (2013a), meeting the 2 °C climate goal under the 450 Scenario would require an estimated USD 16 trillion global increase in investments in low-emission policy and technology.

[28] ADP TEM on RE, the United Kingdom of Great Britain and Northern Ireland's presentation, 2014.

62. IRENA emphasized that, while traditional investors, such as development banks, utilities and climate finance sources, have provided much of the finance for RE development in the past, green bonds, insurance and pension funds, and crowd-sourcing are likely to play an increasingly prominent role in future investment.[29]

63. The World Bank, the GEF and the Government of the United Kingdom of Great Britain and Northern Ireland highlighted catalysing finance for RE deployment as a key focus area to address barriers to RE deployment. Specific needs relate to supporting market entry and enabling environments, reducing investment risk, designing transparent and long-term investment-grade policy instruments, leveraging private finance more broadly and building capacity. IRENA put forward the integrated structure for national finance strategies to support the mobilization of finance presented in figure 4.

Figure 4
National renewable energy finance strategy

Objectives

- Incorporate externalities into the price of energy (align market price with true cost)
- Remove perverse incentives
- Incorporate sustainability considerations into the financial sector
- Overcome niche barriers to renewable energy investment
- Fill financing gaps that the private sector cannot
- Bring renewable energy technologies down the cost curve

Tools

Regulation		*Targeted intervention*	
Energy policy examples:	Finance policy examples:	Public finance programmes:	Non-financial interventions:
• Feed-in tariffs • Tax incentives • Quotas and targets • Self-supply regulation	• Lending criteria based on environmental, social and corporate governance • Green bonds • Differentiated interest rates • Public banking	• Tailored package of financing instruments (with flexible design) • Independent governance structure, public–private partnership	• Capacity-building • Knowledge management • Expertise • Multi-stakeholder coordination

Source: International Renewable Energy Agency. 2012. *Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries.*

64. To address finance needs and challenges related to RE, the following activities that build on international experience could be scaled up: support for private-sector participation in the planning and implementation of RE through legal provisions; designing processes to enhance efficiency and stabilize regulations and policies (including investment-grade instruments); the use of guarantee schemes to support capital access; expanding grid access requirements and the use of robust analytical tools to support access; implementing clear and transparent power purchase agreements; and supporting efforts to enhance standards and the quality of technologies. The World Bank, the GEF, the European Bank for Reconstruction and Development (EBRD), the Government of the United Kingdom and various other institutions offer programmes and assistance aligned with those key areas of support.

[29] As footnote 14 above.

65. Large investments[30] in EE are significantly contributing to reducing energy demand globally (IEA, 2013c). However, despite promising trends, global investments in EE are still approximately one third lower than fossil fuel subsidies, and investments are unevenly distributed across countries and economic sectors. There is also a need for the provision of increased financial support to developing countries to scale up EE-related action. Developing country Parties described difficult choices related to investments in EE that can require the diversion of resources from crucial development programmes to support poverty reduction, health and education. This critical point further highlights the need to align EE-related action with sustainable development goals.

66. To address barriers related to finance and capital access, Parties described a number of programmes, services and other resources to support transformative action on EE in developing countries. Global cooperative initiatives can have a significant impact in supporting the transformation of EE by providing a space for sharing good practices, peer learning, the development of analytical tools and resources, and targeted technical assistance. For instance, under the Sustainable Energy Initiative, EBRD supports EE- and climate-related activities through technical assistance (energy audits, feasibility studies, project implementation, etc.), incentives and grants and enabling policies and regulations. The GEF facilitates EE-related action by providing support for: the implementation of risk-sharing facilities; the evolution of energy servicing company business models to catalyse EE-related action; the design of EE policy frameworks; programmes for phasing out inefficient lighting; as well as other country-specific projects. Finally, UNEP supports a number of EE-related activities in the building sector, including the en.lighten initiative to phase out incandescent light bulbs through stakeholder-led technical consensus, presenting the benefits of EE to policymakers and the public and technical support to countries. UNEP also provides support for the development of NAMAs in various countries.

67. On the basis of experience in the EE sector, EBRD emphasized the following lessons learned in relation to international support to catalyse investment in EE: mainstreaming climate change and EE-related action across both large and small business operations is critical; large private-sector energy companies require expert assistance to implement actions; partnership with financial intermediaries is crucial; small-scale technologies require standardization and cost-efficiency; both project demonstration and implementation and support for policy and enabling frameworks are needed; early demonstrators of technologies and investors should be rewarded; and support is needed for effective measurement, reporting and verification.[31] The World Bank emphasized the need for public–private partnerships to support EE-related action, M&E as a crucial element of EE programmes, and the importance of strong governance frameworks to support coordination, institutional structures and enabling policies.[32]

B. Technology transfer

68. Parties emphasized the important role of developed countries in promoting, facilitating and financing the transfer of technology and related know-how to developing countries in relation to RE and EE. There is a need for expanded efforts to support the research, development and demonstration of innovative technologies that align with national and regional circumstances and to enhance local capacities to develop such technologies. Practically all areas of climate finance discussed in chapter V.A above are relevant to a certain degree to facilitating technology transfer to developing country Parties. Some international initiatives aimed at capacity-building and technology transfer implemented by Parties are highlighted in spotlight box 7.

[30] In 2011 IEA estimated USD 300 billion in total investments in EE globally.
[31] ADP TEM on EE, presentation by EBRD, 2014.
[32] ADP TEM on EE, presentation by the World Bank, 2014.

Spotlight box 7

International initiatives of the European Union on capacity-building and the transfer of renewable energy and energy efficiency technologies

The European Union member States support regional initiatives to improve the key skills needed to ensure a substantial reduction in emissions from energy, including, for example, support for capacity-building and knowledge on geothermal energy provided by the Netherlands and Ireland to Indonesia, and training and capacity-building support in relation to wind power, solar energy and efficient lighting provided by Spain to Guatemala, Honduras and Nicaragua.

The European Union also supports regional initiatives to demonstrate new energy technologies in developing countries. For example, Poland supports an initiative enabling the deployment of small-scale renewable energy (RE) installations, and Austria co-finances the high costs of capital and investment risks by providing financial support for research and development, and promoting market access to new energy technologies.

Another example of regional initiative is the regional RE and energy efficiency (EE) centres in sub-Saharan Africa established by United Nations Industrial Development Organization and Sustainable Energy for All (supported by Austria and Spain) and the Clean Technology Fund (CTF) administered by the World Bank (supported by Spain and Sweden). These centres are particularly effective at enabling countries to develop and implement national strategies promoting low emission technologies.

A regional RE and EE centre was first established to create conditions for RE and EE markets in West Africa and implement projects prepared on the basis of regional strategy documents. Two new regional centres have now been created in East and Southern Africa to replicate the success of the centre in the West Africa.

The European Union also supported the CTF, which finances projects promoting the use of concentrating solar power, solar photovoltaics, geothermal power, wind power and small hydro, EE and co-generation plants, and energy efficient vehicles, in countries such as Algeria, Colombia, Egypt, Indonesia, Jordan, Kazakhstan, Mexico, Morocco, Philippines, South Africa, Thailand, Tunisia, Turkey, Ukraine and Viet Nam.

Source: Submission made by the European Union under workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action in 2014.

C. Capacity-building

69. Scaled-up support for capacity-building in relation to RE is required at a number of levels, including: the technical training of skilled RE engineers, analysts and technicians to support the analysis of technology options as well as RE project planning, installation, maintenance and operation; enhanced capacity to design and implement effective policies that build on international good practices; and financial capacity-building to facilitate private investment and specifically to effectively negotiate power purchase agreements.

70. Expanded support for capacity-building in relation to EE could help to enhance the skills needed to collect robust data initially (especially for the country-specific benchmarking of energy-use patterns and technology performance) and throughout programme and policy implementation, analyse the costs and benefits of opportunities for EE, support the planning (economy-wide and sectoral), design and implementation of effective policies and mobilize finance. Parties noted the need to build capacity for the development of energy serving companies to support the scaled-up diffusion of EE technologies.

71. Capacity-building is required at both the subnational and national levels to ensure RE and EE project planning as well as complex technical and regulatory structures that are

effectively coordinated, implemented and managed. In many cases, more emphasis is placed on national-level capacity-building, while the actual implementation of RE deployment measures occurs at the subnational level. There are also significant opportunities to support the sharing of knowledge from innovative action occurring at the subnational level.[33] Also, more attention could be paid to ensuring the international recognition of successful and innovative policies at the national and subnational levels to provide further incentive to countries to take action and support replication.

72. A number of institutions are supporting RE- and EE-related action by expanding access to capital, facilitating technology transfer and building capacity. Select initiatives are presented in box 2.

Box 2

Select renewable energy and energy efficiency support initiatives and relevant links[a]

- **Clean Energy Solutions Center (CESC)**: An initiative of the Clean Energy Ministerial, and in partnership with UN-Energy, CESC provides a web portal for decision makers in the area of clean energy to access no-cost remote expert assistance to support clean energy policy design and implementation. CESC also provides best practice resources, data and tools, policy reports and other training forums focused on supporting decision and policymaking in relation to clean energy (<https://cleanenergysolutions.org/>). CESC partners with specific energy efficiency (EE) programmes to support more targeted assistance, including: the Super-efficient Equipment and Appliance Deployment Initiative (<www.superefficient.org>) and Collaborative Labelling and Appliance Standards Programme, focusing on appliance energy performance (<www.clasponline.org>)
- **Climate Technology Centre and Network (CTCN)**: The CTCN will provide technical support to countries to address climate-related needs and requests via nationally designated entities (<http://www.unep.org/climatechange/ctcn/>)
- **Clean Technology Fund (CTF)**: CTF pools USD 5.5 billion in donor resources to support country and regional investment plans, with a focus on integration with broader development priorities. To date, the investment plans have led to 2,626 MW installed renewable energy (RE) capacity and leveraged USD 3.5 billion in co-financing from multilateral development banks and the private sector. CTF demonstrates a programme supporting significant action at scale to bring about large-scale transformation (<https://www.climateinvestmentfunds.org/cif/node/2>)
- **Green Climate Fund (GCF)**: The GCF is anticipated to support a broad range of climate change action related to RE (among other focal areas), including: city planning and the design of measures to support mitigation and adaptation; low-emission energy access and power generation (small, medium and large scale); capacity-building and readiness activities for mitigation; and the coordination of 'knowledge hubs' and other public goods to support learning. The GCF readiness work programme will include the establishment of national focal points, support for strategic frameworks, including nationally appropriate mitigation actions, the designation of implementing institutions and the development of an initial pipeline of project proposals (<www.gcfund.org/>)
- **ICLEI Local Governments for Sustainability**: ICLEI works with a number of programmes that provide technical support for subnational action, namely: the GreenClimateCities programme (<www.iclei.org/gcc>); the Global Protocol for Community-scale GHG Emissions (<www.ghgprotocol.org/city-accounting>); HEAT+, a greenhouse gas quantification and monitoring tool (<http://heat.iclei.org>); the Urban Low Emission Development Strategies project (<www.urban-leds.org>); the Procura+ Campaign for green public procurement (<www.procuraplus.org>); and the Local Renewables Initiative and Conferences (<www.local-renewables-conference.org>)
- **International Energy Agency (IEA)**: IEA supports a number of RE and EE initiatives around the world and produces various documents and resources to support EE-related action, including policy recommendation documents and market reports (<http://www.iea.org/topics/energyefficiency> and

[33] ADP TEM on RE, presentation by ICLEI Local Governments for Sustainability, 2014.

<http://www.iea.org/topics/renewables/>)

- **International Partnership for Energy Efficiency Cooperation (IPEEC)**: IPEEC is an autonomous international forum that provides global leadership on EE by facilitating government implementation of policies and programmes to yield EE gains. IPEEC is dedicated to facilitating the rapid deployment of clean energy technologies worldwide and promoting information exchange on best practices to facilitate initiatives that improve EE (<http://www.ipeec.org/>)
- **International Renewable Energy Agency (IRENA)**: IRENA provides support for RE through a number of resources and services. Its Project Navigator provides best practices and tools to support project development and facilitate access to finance and address barriers associated with proving RE bankability, project proposal development skills and high costs and risks associated with project development. Further resources and activities provided include: planning for the global energy transition; a gateway to knowledge on RE; enabling investment and growth; renewable energy access for sustainable livelihoods; islands: lighthouses for RE deployment; and regional action agenda, which are presented in the work programme of IRENA (<http://www.irena.org/menu/index.aspx?mnu=cat&PriMenuID=44&CatID=61>). It also provides information on financial mechanisms to support RE deployment(<http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=282>)
- **Low Emission Development Strategies (LEDS) Global Partnership Remote Expert Assistance for LEDS (REAL)**: Through the REAL service, the LEDS Global Partnership connects country teams to an extensive network of LEDS professionals to provide virtual consultation and advice. Those LEDS professionals then quickly respond to the countries' questions about LEDS analysis, energy, finance, transportation and waste (<http://ledsgp.org/assistance>)
- **Renewable Energy and Energy Efficiency Partnership (REEEP)**: REEEP is a market catalyst for clean energy in developing countries and emerging markets. It acts as a funder, information provider and connector for upscaling clean energy business models and so far has supported more than 180 projects in 58 countries. (<http://www.reeep.org/>).
- **Sustainable Energy for All (SE4All)**: In partnership with more than 80 countries and a number of international and private-sector institutions, SE4All supports the achievement of universal access to modern energy by 2030 and a doubling of the share of RE and EE gains globally. To achieve that outcome, SE4All supports: gap analyses; the development of national action plans focused on enabling environments and capacity-building; and catalysing investment and implementation (<http://www.se4all.org/>)
- **United Nations Environment Programme (UNEP)**: UNEP supports a number of EE-related activities in the building sector, including: the en.lighten initiative to phase out incandescent light bulbs through stakeholder-led technical consensus; and presenting the benefits of EE to policymakers and the public and technical support to countries. UNEP also provides support for the development of nationally appropriate mitigation actions in various countries (<www.unep.org>)
- **World Business Council on Sustainable Development (WBCSD)**: WBCSD brings together over 200 members across regions and sectors and is a key player in ensuring the active and engaged role of the private sector in climate change action. Building on a longer-term WBCSD Vision 2050 study, the WBCSD Action 2020 initiative provides a forum for private-sector support of sustainable development up to 2020 and beyond. In relation to the topics covered in this technical paper, WBCSD supports action in relation to sustainable cities, electrifying cities towards zero emissions, EE in buildings, low-carbon electrification of remote areas and resilient power systems (<http://www.wbcsd.org/>).

[a] Additional information on cooperative initiatives is available at <http://unfccc.int/focus/mitigation/items/7785.php>.

VI. Possible next steps to support action in relation to renewable energy deployment and energy efficiency improvements

A. Renewable energy

73. A number of actions to support the realization of mitigation ambition through increased deployment of RE technologies were proposed by Parties, UNFCCC institutions and the secretariat during the discussions at the TEMs. On the basis of engagement in and learning from the TEM process and other complementary initiatives and partnerships and with support from existing platforms, such as the NAMA registry, Parties could be positioned to launch new and ambitious policies and actions to support concrete progress before and beyond 2020, such as those outlined in the policy menu in table 1.

74. UNFCCC institutions such as the Technology Mechanism, the TEC and the CTCN will be critical in assisting countries with the deployment of RE. Building a pipeline for the future funding of policy and programme options could be supported by other UNFCCC institutions such as the GCF and the GEF. International institutions and partnerships, including IRENA and SE4ALL, could continue to engage with Parties through the process initiated by the TEMs to support them in addressing needs in relation to RE, to coordinate and enhance partnerships, and to deliver key messages and signals coming out of the process to the private sector that could help to leverage further investment.

75. The secretariat could support the actions noted in paragraphs 73 and 74 above by designing a common platform for the registration of country-specific policies, challenges, successes and failures, to be elaborated and further discussed within the TEM process. As a follow-up to the TEMs, the secretariat could provide a valuable service in connecting Parties with information, organizations, partnerships and other services to address country-specific needs.

76. Engaging subnational actors as well as additional private-sector and technical agencies could broaden and deepen the discussion on RE policy successes and failures. Connections with such entities and the discussions could be facilitated by the secretariat. Parties emphasized the need to focus discussion and related technical work on practical action and implementation rather than on potential, especially in advance of the ministerial meeting in June 2014 and the United Nations Secretary-General's summit in September 2014.

77. More specific actions to support RE deployment to be undertaken by Parties, relevant institutions and partnerships and the secretariat could include: continuing to build best practice information on effective policies and finance mechanisms to enhance RE by updating this technical paper with reference to technical support opportunities; facilitating policy coordination through cooperative initiatives; encouraging Parties to provide more detailed reporting on the application of policies and how they are able to overcome barriers in their national communications and biennial reports; and streamlining access to relevant international financial support to mobilize investments in RE.

B. Energy efficiency

78. Building on the results of the ADP technical examination process, TEM participants felt that new and ambitious EE-related actions and policies, drawing on the examples and good practices described during the meetings, could be launched to contribute to pre- and post-2020 action. Parties noted the need for a continued and comprehensive focus on paragraphs 7 and 8 of decision 1/CP.17 under ADP workstream 2. To support the effective implementation of

action, Parties also noted that international institutions and partnerships, such as IEA and IPEEC, should continue to engage in the TEM process.

79. Parties described a number of actions that could be taken to support the transformation of EE, including addressing key challenges by elevating EE to a high-level national priority with strong governmental leadership, and adopting and replicating successful and innovative actions and policies. However, Parties expressed a need for further peer learning opportunities and additional detail on approaches to successfully implement actions. The NAMA registry was noted as a resource to facilitate collaboration on EE that could be improved through connection with a financial mechanism.

80. The role of the UNFCCC is deemed important in catalysing political will and action by Parties to realize pre- and post-2020 energy-sector transformation. Namely, the UNFCCC could continue to function as a platform for action-focused discussion, facilitating dialogue between Parties, international organizations and support institutions. Future discussion could continue to focus on successful examples, creative and innovative action and opportunities for replication. Future meetings under ADP workstream 2 should also consider the process to allow for ongoing discussions in that regard.

81. Practical knowledge and information management was also emphasized as a key area to support countries in designing policies and incentives, assessing investment opportunities and determining options for international support. UNFCCC institutions, such as the Technology Mechanism, the TEC and the CTCN as well as the GCF, and the GEF could further support the scale-up of EE, and developing a pipeline of GCF and CTCN projects could facilitate further investment. Enhanced action could also be taken to match countries' needs for support with international technical institutions and resources to provide assistance. Building on that point, an observer organization proposed a Building Sector Financing Facility (possibly through the GCF) to implement a robust building sector emission reduction road map through the provision of financial support, access to expert and technical assistance, expanding access to relevant tools to support the improvement of EE, and support for public–private partnerships.

82. Finally, to promote EE to the level needed to meet the 2 °C climate goal will require a significant increase in EE-related activities. Much of that additional action is economically viable, and yet is likely to remain unexploited. Engaging subnational actors as well as additional private-sector and technical agencies in EE-related actions is as relevant as for RE-related actions (see para. 76 above). Strengthening existing initiatives and, where relevant, building new ones that bring together a broader range of beneficiaries of EE is necessary to generate increased support for EE programmes within governments, the private sector and the public. To that end, outreach to other stakeholders in order to build stronger coalitions could be supported under ADP workstream 2.

VII. Possible action by the Ad Hoc Working Group on the Durban Platform for Enhanced Action to unlock mitigation opportunities in relation to renewable energy deployment and energy efficiency improvements in the pre-2020 period

83. To advance and catalyse action under workstream 2 of the ADP, a number of Parties proposed a technical process to analyse and identify development-focused mitigation opportunities and good practices, under a 'policy menu', which could become a concrete output of the technical process under workstream 2.

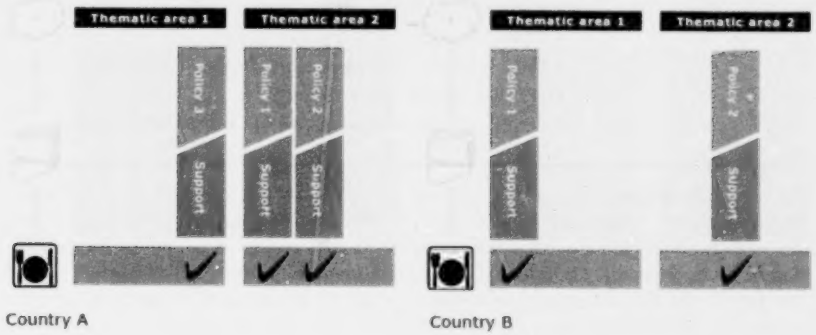
84. The policy menu could align with an approach comprising three key elements: (a) identifying key thematic areas with high mitigation and sustainable development potential; (b) designing good practice policy menus and support options; and (c) 'signing up' for

combinations of policies and support. There could also be a process of formal recognition of cooperative initiatives under the UNFCCC.

85. Those key elements are presented in figure 5 for two example countries, which first identify key thematic areas and policy menus with high mitigation and sustainable development potential and then identify and sign up for support options to address their specific policy needs.

Figure 5

Example of a good practice policy menu for two countries



Source: Höhne N, Braun N, Ellermann C and Blok K. 2014. *Towards a policy menu to increase greenhouse gas mitigation ambition.*

86. More specifically, building on readily available information, relevant actors would first assess potential (e.g. emission reductions, investment needs, co-benefits, barriers, etc.) in an identified area of focus. The approach would then include a deeper search to identify key barriers, successful government policies and options for support related to those key barriers and successful policy models (e.g. through development banks, the GCF, the GEF, etc).

87. The chapters of this technical paper on RE and EE provide a starting point for organizing action around policy menus; namely, policies and good practices were identified to address key barriers to RE and EE, elements of enabling environments were defined for each policy option to support successful policy replication and implementation, and support options for each policy were suggested. Building on that structure, and as presented in table 3, a country could identify various EE policies on the basis of the thorough assessment process referred to in paragraph 84 above and then identify connection points between each of the policies and available support options (Höhne et al., 2014).

Table 3

Energy efficiency policy options and examples of support initiatives

Policy options	*Example support initiatives*
Appliance standards and labelling programme	• Collaborative Labeling and Appliance Standards Programme: <www.clasponline.org> • Super-efficient Equipment and Appliance Deployment Initiative: <www.superefficient.org> • Global Efficient Appliances and Equipment Partnership: <website forthcoming> • International Partnership for Energy Efficiency Cooperation (IPEEC): <http://www.ipeec.org/>
Incandescent light bulb	• Clean Energy Solutions Center:

Policy options	*Example support initiatives*
phase-out programme	<https://cleanenergysolutions.org/> • United Nations Environment Programme (UNEP) and Global Environment Facility en.lighten initiative: <http://www.enlighten-initiative.org> • International Energy Agency (IEA): <http://www.iea.org/topics/energyefficiency> • IPEEC: <http://www.ipeec.org/>
Building energy codes	• Clean Energy Solutions Center: <https://cleanenergysolutions.org/> • Global Buildings Performance Network: <http://www.gbpn.org/> • IEA: <http://www.iea.org/topics/energyefficiency> • IPEEC: <http://www.ipeec.org/> • UNEP Sustainable Buildings and Climate Initiative: <http://www.unep.org/sbci/>

88. Under that approach, and as noted in paragraph 86 above, countries could 'sign up' for concrete policy options and relevant support. Support could include good practice mentoring by countries that have undertaken successful activities related to the policy area and/or more tailored support to address technical, financial, economic and other policy barriers (e.g. through the GEF or the GCF). Current international initiatives are already facilitating the connection of countries and support programmes, either through sign-up processes or more informal information exchange (e.g. through initiatives and partnerships). Examples of initiatives that either formally or informally facilitate the connection of countries with support programmes include: the Clean Energy Solutions Center, the CTCN, the Low Emission Development Strategies (LEDS) Global Partnership Remote Expert Assistance for LEDS service, the NAMA registry and the UNEP en.lighten initiative.

89. To strengthen the approach outlined in paragraph 84 above, Parties could continue to be actively engaged in sharing experiences and proposals for collaborative efforts to support new actions, leverage effective activities, and move current initiatives forward. ADP workstream 2 can support such outcomes by supporting and facilitating collaborative partnerships between countries and institutions working to move policies forward and those that could provide support and lessons from experience. ADP workstream 2 should effectively leverage existing UNFCCC institutions, such as the TEC, the CTCN and the GCF, and the GEF to align needs with support and scale up successful initiatives. Working with current mechanisms could allow for a more streamlined and effective identification of policy and good practices and successful examples, as well as available capacity-building, technology transfer and financial support for the design and implementation of policies. International organizations and partnerships, such as IEA, IRENA, IPEEC and SE4All are also crucial in supporting such work. Finally, Parties should be further incentivized to pursue appropriate national mitigation actions that could be aligned with their post-2020 commitments.[34]

90. Cooperative initiatives could play a strengthened role in supporting policy action through more formal recognition and engagement with countries that may face political or economic challenges in raising mitigation ambition. In particular, their role could be expanded by: encouraging cooperative initiatives to set targets and monitor their impact, with robust accounting processes to avoid double counting; further tracking the actions, impact and support of cooperative initiatives at the global level; facilitating knowledge sharing and collaboration between cooperative initiatives and with government agencies; and strengthening or supporting new cooperative initiatives to have a greater impact, address gaps and become a channel for climate finance (Harrison et al., 2014). The UNFCCC could play an important role in tracking,

[34] Submission made by the European Union under the ADP workstream 2 in 2014.

supporting and strengthening the activities of cooperative initiatives, but the degree to which such engagement might occur presents different challenges and benefits (Harrison et al., 2014).

91. To support the coordination of cooperative initiatives, the UNFCCC could develop an aggregated clearing house, bringing together various climate action sub-registries (e.g. the NAMA registry and the ICLEI Local Governments for Sustainability City Platform) to form a common and dynamic platform. Such a platform could support the development of networks around common topics, sectors, policies, etc. and engage critical non-state and subnational actors. The platform could build on the current portal on cooperative initiatives[35] prepared by the secretariat to create a more dynamic environment for virtual collaboration and networking and real-time information updates, and could highlight and recognize successful, innovative and robust actions and commitments.

92. Building on the scaled-up activities by cooperative initiatives, WWF proposed that under workstream 2 the ADP could support a 'race to the top' in relation to action on EE and RE by providing a platform for information sharing and peer learning among countries, by further connecting means of support and finance with implementation needs by mobilizing developed country public finance and leveraging other sources of private finance, and finally by providing a platform for sharing best practices, which could possibly be aligned with the policy menu concept noted in paragraph 87 above. Also, specific databases could be developed to share good practices and innovative policy approaches.

93. Going forward, the TEMs should provide the foundation for activities beyond 2014 under ADP workstream 2 and be a starting point for an on-going multi-stakeholder initiative to scale up action. The TEMs (particularly those to be held in June 2014) could be enhanced by applying lessons learned from the TEMs held in March 2014, by ensuring adequate time for preparation and the exploration of previously identified and new actions with high mitigation potential, and by releasing information, sending invitations and engaging non-Party actors early in the planning process. Future TEMs will also provide an opportunity to focus on other key thematic areas, such as land use and short-lived climate pollutants.[36]

94. Parties put forward a few options for the continuation of activities under workstream 2 following the conclusion of the ADP at the end of 2014, including: the reorganization of workstream 2 as a separate technical process under the Convention or as a technical process under the permanent subsidiary bodies under the Convention; or the continuation of workstream 2 in 2015, building on the progress made over the last two years. Further discussions will be held on that topic by the ADP in 2014 to determine the best path forward for the ADP more broadly.

95. In addition, Parties emphasized the need for on-going and scaled-up developed country support for finance, technology and capacity-building, including a road map on expanding financial support up to 2020. As noted in paragraph 90 above, while cooperative initiatives play an important role in the provision of support, that support should not be explicitly linked to introducing new commitments for developing countries.

[35] Available at <http://unfccc.int/focus/mitigation/items/7785.php>.
[36] As footnote 34 above.

Reference table 1

Overview of thematic areas presented in the second version of this technical paper (FCCC/TP/2013/8)

Thematic area[a]	*Mitigation potential by 2020 in Gt CO_2 eq*[b]	*Sustainable development benefits*	*Barriers*	*Examples of national actions*	*Indicative number of cooperative initiatives*[c]
Energy supply	2.2–3.9	• Energy security • Economic diversity and resilience • Reduced air pollution and health costs	• Higher costs of low-carbon options compared to conventional fossil-fuel options • High increase in the demand for electricity driven by economic growth and the lack of affordable alternatives to fossil fuels to meet such demand • Market organization and price distortions	• Emissions trading (pricing carbon) • Carbon taxes (pricing carbon) • Emission standards (avoiding carbon lock-in) • Technology-specific support for research, development and demonstration (enabling future reductions, bringing costs down)	23
Fuel switching limiting inefficient coal use	0.5–1				
Renewable energy sources	1.5–2.5 (electricity and heat only)				
Carbon capture and storage	0.2–0.4				
Methane from fossil-fuel production	0.6				
Energy efficiency	Up to 2.9	• Macroeconomic benefits • Often cost-effective • Social improvements • Reduced air and water pollution and health costs • Positive impact on public budgets and fossil-fuel import bills	• High upfront capital costs and perceived capital risk • Lack of affordable technologies suitable to local conditions • Market organization, price distortions and split incentives • Information barriers	• Minimum performance standards (overcoming investment risks) • Energy-saving obligations, possibly with certificate trading (overcoming investment risks) • Energy audits and negotiated agreements (awareness-raising)	24
Building heating and cooling	0.5				
Appliances and lighting	0.5				
Industry	0.4				
Transport	0.2				
Renewable energy	1.5–2.5	• Social improvements • Macroeconomic benefits • Reduced air and water pollution and health costs • Positive impact on public budgets and fossil-fuel import bills	• High upfront capital costs and perceived capital risk • Lack of affordable technologies that are suitable to local conditions • Market organization and price distortions	• Renewable energy targets (providing long-term stability) • Feed-in tariffs (lower costs) • Obligations to supply a share of electricity, heat and fuels from renewable sources (overcoming investment risks) • Tradable certificates (pricing carbon)	24
Electricity and heat production					
Biofuels	–				

				• Net metering (overcoming storage) • Direct subsidies or tax credits (bringing costs down)	
Transport	1.7–2.5				
Land-based transport		• Improved health and safety • Job creation	• High upfront capital costs and perceived capital risk • Market organization and price distortions	• Avoid (transport-related land-use policies, avoiding carbon lock-in) • Shift (bus rapid transit, avoiding carbon lock-in) • Improve (vehicle performance standards, overcoming investment risks)	24
Aviation and shipping	0.3–0.5	• Development and diffusion of new technologies • Air quality improvement • Job creation	• Increasing traffic volumes • Trade-offs between reducing carbon emissions and increasing nitrogen oxide emissions • Indirect emissions (from land-use change and biofuel production) • Market organization and price distortions	• Air traffic management (allowing efficient routes) • Shipping energy management plans (awareness-raising) • Aircraft and ship emissions standards (overcoming investment risks) • Emissions trading schemes (pricing carbon)	5
Fossil fuel subsidy reform	1.5–4.5	• Economic growth • Enhancing development and diffusion of new technologies • Environmental and health benefits • Social welfare benefits	• Lack of information • Lack of administrative capacity • Concerns regarding adverse economic impacts • Concerns regarding adverse impacts on the poor • Opposition from specific interest groups	• Reform plan • Communications strategy (getting public buy-in) • Phased energy price increases (softening adverse economic impacts) • Improved efficiency of state-owned enterprises (act by example) • Targeted measures to avoid adverse impacts on the poor	1
Reducing short-lived climate pollutants, including fluorinated gases General	1.1	• Improved health and air quality • Improved quality of agricultural production and ecosystems	• Residential: high fuel and technology costs, low awareness of health impacts • Agriculture and forestry: weak enforcement, low stakeholder awareness, high costs of modified feed • Industrial processes: limited access to finance and community awareness	• Regulation (overcoming investments risks) • Economic incentives (pricing emissions)	3

			• Fossil-fuel industry: high investment costs and technical constraints • Transport: unavailability of ultra-low sulphur fuels		
Fluorinated gases	0.5	• Energy savings • Adaptation	• Need for technical developments • Flammability and toxicity risks • Regulations and standards that inhibit the use of alternatives • Insufficient supply of components • Investment costs • Lack of relevant skills	• Vehicle refrigerant regulation (overcoming investment risks) • National and regional fluorinated gas regulations (overcoming investment risks)	1
Land use Forestry Agriculture	 1.3–4.2 1.1–4.3	• Environmental protection • Biodiversity • Job creation • Adaptation	• Lack of finance • Poor enabling environment • Lack of access to effective low-cost technology • Vulnerability of forest resources • Poor data • Drivers of deforestation	• Protected areas expansion • Command and control measures • Economic instruments	23
Waste	0.8	• Public health improvements • Environmental protection • Closing the nutrient cycle and avoiding methane emissions	• Lack of finance • Lack of capability to assess benefits • Lack of technology transfer	• Composting • Waste regulation (e.g. landfilling)	11

[a] Thematic areas partly overlap. A description of the areas can be found in addendum 1 of the second version of the technical paper, contained in document FCCC/TP/2013/8/Add.1.

[b] Mitigation potential estimates for energy efficiency and renewable energy are from IEA, 2012. Mitigation potential estimates for fossil-fuel subsidy reform are from IMF, 2013. Mitigation potential estimates for reducing emissions from fluorinated greenhouse gases and reducing short-lived climate pollutants are from UNEP, 2011c. Mitigation potential estimates for transport, land use and waste are from UNEP, 2012. Some estimates are probably underestimated compared to others, owing to the use of different sources and methodologies. Potential values are not strictly comparable and are not additive, as they partly overlap.

[c] The number of cooperative initiatives is indicative because not all initiatives may be included and for some the coverage is unclear or ambiguous, while some other initiatives are cross-cutting in terms of their thematic coverage.

[d] Some short-lived climate pollutants are outside of the definition of the emissions gap. Assuming full implementation of measures by 2020, the impact of the emission reductions achieved in that year on the global temperature over a 100-year time horizon would be about 1.1 Gt CO_2 eq.

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Updated compilation of information on mitigation benefits of actions, initiatives and options to enhance mitigation ambition

Technical paper

Addendum

Technical examination process to unlock mitigation potential for raising pre-2020 ambition through renewable energy deployment and energy efficiency improvements

Summary

This updated technical paper compiles information on the mitigation and sustainable development benefits of actions, initiatives and options to enhance mitigation ambition, with a focus on the thematic areas of renewable energy and energy efficiency. Information for the update was provided in submissions from Parties and observer organizations and at the technical expert meetings held during the fourth part of the second session of the Ad Hoc Working Group on the Durban Platform for Enhanced Action, held in March 2014 in Bonn, Germany. This technical paper builds on the second version thereof, contained in document FCCC/TP/2013/8 and its two addenda FCCC/TP/2013/8/Add.1 and 2, and consists of the main document and an addendum. The addendum is focused on mitigation action in the thematic areas of renewable energy and energy efficiency and elaborates on mitigation potential, progress, benefits, costs and barriers, as well as on good practice policies, key opportunities and options for catalysing concrete actions in those two thematic areas.

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I. Introduction

1. This update of the technical paper on mitigation benefits of actions, initiatives and options to enhance mitigation ambition was requested by the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) at the third part of its second session.[1] The first and second versions of this technical paper were published on 28 May and 30 October 2013, respectively, and are contained in documents FCCC/TP/2013/4 and FCCC/TP/2013/8 and Add.1 and 2.

2. It comprises two parts: the main text, contained in document FCCC/TP/2014/3, and an addendum, contained in document FCCC/TP/2014/3/Add.1. The main text contains a summary of the main findings, which are substantiated by the more detailed information provided in the addendum, which captures the content of the discussions that took place at the technical expert meetings (TEMs) on renewable energy (RE) and energy efficiency (EE) held in March 2014 during the fourth part of the second session of the ADP.[2] The two chapters of this addendum are dedicated to covering the discussions on RE deployment and EE improvements and each consists of two parts, discussing potential, progress, benefits, costs and barriers and then practices, policies and actions to catalyse RE deployment and EE improvements.

II. Technical summary on renewable energy

A. Potential, progress, benefits, costs and barriers

3. The analysis of the International Energy Agency (IEA) (2013a) shows that meeting the 2 °C climate goal set by the international community is still achievable through the vastly expanded adoption and replication of energy policies, technologies and other actions that build on successes around the world. As described in the IEA 450 Scenario,[3] targeted investment and support for actions to expand growth in wind, hydro and solar photovoltaics (PV) could lead to half of global electricity being supplied by RE by 2035. However, IEA also describes the need, in order to realize such a future, for "unprecedented change" and "urgent commitment to strong action, followed by robust, unwavering implementation", as a pathway focused on current and planned policies will not be sufficient to meet the 2 °C goal.

4. The 450 Scenario requires significant mitigation action in the energy sector before 2020, which could result in 3.1 billion tonnes of carbon dioxide equivalent (Gt CO_2 eq) emission reductions by 2020, or approximately 80 per cent of the overall reductions needed to meet the 2 °C goal. Under the scenario, and in combination with a number of other actions in the energy sector, RE would replace significant amounts of traditional fossil fuel power and would account for 48 per cent of global power generation by 2035 (IEA, 2013a). Enhancing current RE policies (aligned with the IEA New Policies Scenario) could lead to 31 per cent of global power generation coming from RE sources by 2035 and 4.1 Gt CO_2 eq emission savings; however, that would not be sufficient to meet the 2 °C goal (IEA, 2013b). Figure 1 presents a comparison of the mitigation potential of the two IEA scenarios.

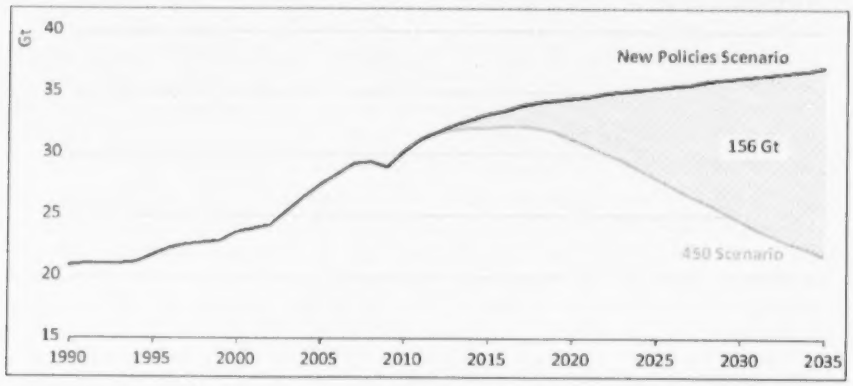
[1] FCCC/ADP/2013/3, paragraph 30(c)(ii).

[2] Detailed information on the TEMs held in March, including the initial summaries of discussions at the meetings, is available at <http://unfccc.int/bodies/awg/items/8112.php> and <http://unfccc.int/bodies/awg/items/8113.php>.

[3] The 450 Scenario projects a stabilization of the concentration of greenhouse gases at 450 ppm.

Figure 1

Global energy-related emissions under the International Energy Agency New Policies Scenario and 450 Scenario

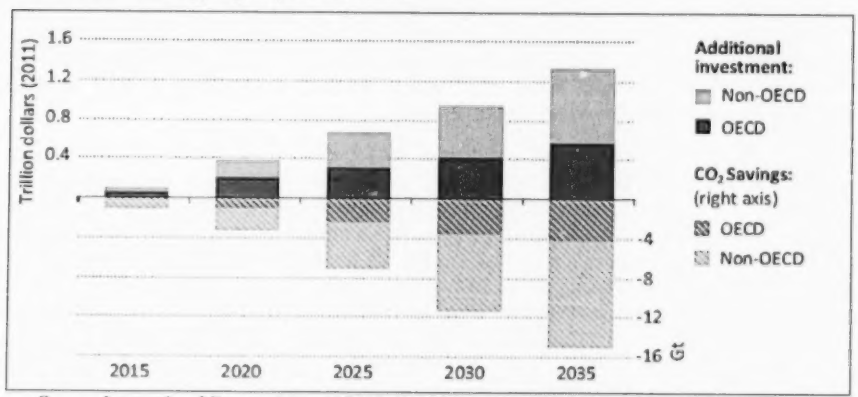


Source: International Energy Agency. 2013. *World Energy Outlook Special Report 2013: Redrawing the Energy-Climate Map*.

5. Meeting the 2 °C climate goal under the 450 Scenario would require an estimated USD 16 trillion global increase in investments in low-emission policy and technology. In addition to the vast climate-related benefits, such investments could also lead to significant national account savings, with fossil fuel import bills reduced by USD 850 billion for the top five fossil fuel importers, as well as various other key benefits described below (see table 1). Figure 2 presents annual additional investments and projected CO_2 savings at the global level.

Figure 2

Global annual additional investments and projected CO_2 savings under the International Energy Agency 450 Scenario



Source: International Energy Agency. 2013. *World Energy Outlook Special Report 2013. Redrawing the Energy-Climate Map*.

Abbreviation: OECD = Organisation for Economic Co-operation and Development.

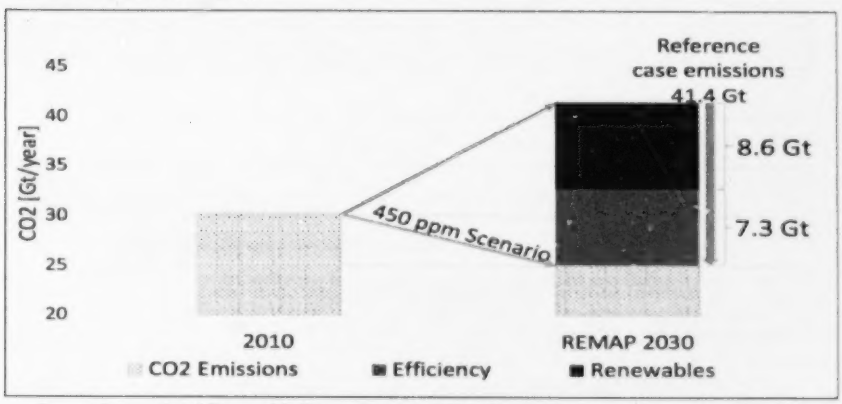
6. The United Nations Environment Programme (UNEP) *Emissions Gap Report 2013* describes RE as a key sector for mitigation action, which could lead to 1–3 Gt CO_2 eq emission reductions by 2020 through international collaboration to support reductions in three targeted areas: solar PV (possible 1.4 Gt CO_2 eq emission reduction), wind energy (1.2 Gt CO_2 eq) and low-emission energy access options (0.4 Gt CO_2 eq) (Blok et al., 2013). The report notes 17 key

international initiatives that could be expanded and enhanced to achieve significant emission reductions in those areas (UNEP, 2013). The Intergovernmental Panel on Climate Change (IPCC) also describes a key role for RE in the future, noting that, with the necessary enabling conditions and policies, RE could supply approximately 80 per cent of global energy by 2050 (IPCC, 2011).

7. Aligned with the projections detailed in paragraph 4 above, according to the global renewable energy road map of the International Renewable Energy Agency (IRENA), namely REmap 2030,[4] doubling RE capacity between now and 2030 could lead to approximately 9 Gt CO_2 eq emission savings annually.[5] Coupled with EE-related actions, and accounting for associated reductions in methane emissions, this could lead to savings of approximately 16 Gt CO_2 eq emissions. Figure 3 presents a mix of actions that could support such an outcome in 2030.

Figure 3

Opportunities for reducing emissions by 2030 based on the International Renewable Energy Agency REmap 2030 study



Source: International Renewable Energy Agency. 2014. *Renewable Energy Innovation Policy: Success Criteria and Strategies*.

Abbreviation: REmap = renewable energy roadmap.

8. When evaluating the potential of RE, one must go beyond power technologies to also consider end-use applications (transport, industry and buildings). As a whole, the role of end-use technologies, such as solar thermal, biofuels, electrical vehicles, etc., could be substantial in meeting global energy demand by 2030[6] and they could provide a 32 per cent contribution to doubling the share of RE in total final energy consumption by 2030 (IRENA, 2014).

9. Global RE capacity continues to expand rapidly on an annual basis, with the annual average growth rates of solar PV, concentrating solar power and wind power from 2007 to 2012 being 60 per cent, 43 per cent and 25 per cent, respectively (Renewable Energy Policy Network for the 21st Century (REN21), 2013). Over half of new electricity generation capacity came from renewables in 2012 (REN21, 2013) and RE capacity has doubled in recent years.[7] The success of RE in relation to projections that were made over the last decade, which estimated significantly fewer additions to RE capacity, demonstrates that many perceived barriers were overcome earlier and more effectively than expected (REN21, 2013).

[4] REmap is an exploratory study considering technology options (costs and potential) rather than scenarios and targets. The study analyses 26 countries, making up 75 per cent of global energy use. The analysis should be considered as a starting point for evolution over time.

[5] Compared with the 2030 reference case.

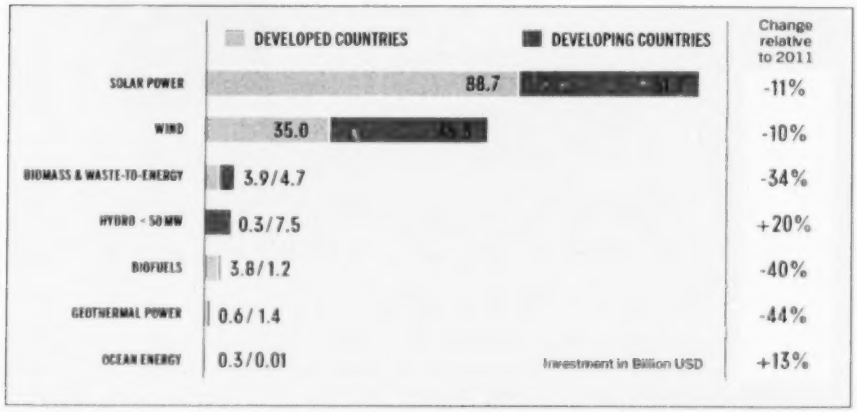
[6] ADP TEM on RE, presentation by IRENA, 2014.

[7] As footnote 6 above.

10. Although biofuel production recently stagnated, with a negative annual growth rate in 2012,[8] there is still great promise for advanced biofuels, with production expected to increase by 250 billion l/year between 2014 and 2030 (REN21, 2013). However, food security issues must also be taken into account when considering biofuel activities. Brazil offers a valuable example of successful support for bioelectricity, bioethanol and biodiesel. Notably, as a result of bioethanol blending mandates, flex-fuel vehicles currently make up 52 per cent of the light-vehicle fleet in Brazil and ethanol use has led to the avoidance of 44 Mt CO_2 eq emissions annually.[9] Commercially viable biogas activities are also expanding rapidly around the world.

11. According to REN21 (2013), uncertainty around long-term policy support for RE in developed countries (primarily in Europe and the United States of America) led to a decline in the total investment in new RE capacity in 2012. Global investment in RE in 2012 totalled USD 244 billion (a decrease of 8 per cent from the record high in 2011). Investment activity shifted prominently to developing countries in 2012, making up 46 per cent of total new investment in RE (USD 112 billion, an increase of 34 per cent since 2011). In total, solar power received the greatest share of new investment in 2012 (57 per cent, or USD 140.4 billion), followed by wind (USD 80.3 billion) and hydro (USD 33 billion). The RE-related investment trends in 2012 are presented in figure 4.

Figure 4
Trends in global investment in renewable energy in 2012



Source: Renewable Energy Policy Network for the 21st Century. 2013. *Renewables 2013: Global Status Report*.

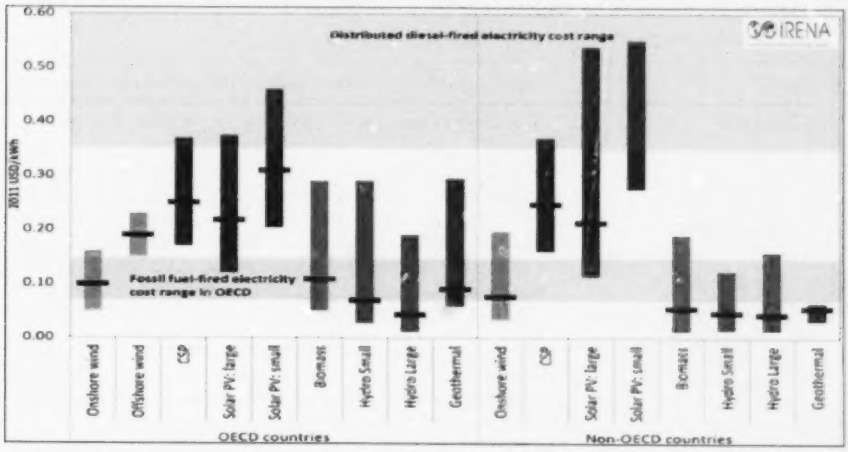
12. Despite the lower investment levels in 2012 and 2013, RE generation continues to be an increasingly competitive investment opportunity. While traditional investors, such as development banks, utilities and climate finance sources, have provided much of the finance for RE development to date, green bonds, insurance and pension funds, and crowd-sourcing are likely to play an increasingly prominent role in future investment.[10]

13. As a result of technological advances, economies of scale and component production surplus, the prices of solar PV and onshore wind power have continued to decline over time (REN21, 2013). In many cases, and as presented in figure 5, RE technologies now offer the most economic solution for new power generation capacity (IRENA, 2013). As a notable example, spotlight box 1 describes the United States SunShot Initiative, which has supported the declining

[8] As footnote 6 above.
[9] ADP TEM on RE, Brazil's presentation, 2014.
[10] As footnote 6 above.

price of solar PV by focusing on all stages of RE diffusion from research and development (R&D) to deployment.

Figure 5
Comparison of electricity costs across technologies in 2011



Source: International Renewable Energy Agency. 2013. *Renewable Energy Innovation Policy: Success Criteria and Strategies*.

Abbreviations: CSP = concentrating solar power, OECD = Organisation for Economic Co-operation and Development, PV = photovoltaics.

Spotlight box 1
Supporting the reduction in cost of renewable energy technologies

United States of America: Renewable energy (RE) capacity in the United States has doubled since 2008, bringing the total to 86 GW (not including hydro). Building on that progress, the United States is seeking to expand clean energy electricity to 80 per cent of energy generated and to increase the cost-competitiveness of RE technologies. Solar power in the United States has experienced notable success, with an approximately 60 per cent annual growth rate and an 80 per cent reduction in price over the last four years, providing broad benefits to the global community. Supporting solar power from a systemic and integrated perspective, the United States Department of Energy's SunShot Initiative is a major contributor to such success, focusing on all stages of RE diffusion from research and development (R&D) to deployment. Specifically, the programme supports R&D in relation to solar photovoltaics and concentrating solar polar, systems and grid integration analysis, technology development and advancing innovation in domestic manufacturing. The programme seeks to address key challenges associated with RE technologies by engaging stakeholders in innovative ways of supporting the reduction of 'soft' (finance and other non-hardware) costs, minimizing grid integration costs through the development of new technologies, and supporting manufacturer competitiveness by developing partnerships with state and local governments and industry. Since 2011 the price of solar power has dropped from 21 cents to 11 cents/kWh and SunShot Initiative has a goal of continuing to reduce the price of solar electricity to 6 cents/kWh by 2020.

Source: The United States' presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

14. The alignment of mitigation actions with development goals is of critical importance to countries around the world and crucial in building motivation and political support for action on

RE. Parties described a number of development benefits, drivers and broader macro-objectives closely linked with action in the RE sector, which are presented in table 1. Spotlight box 2 describes efforts undertaken in two countries to align RE-related activities with critical development and climate goals in the context of their unique national circumstances.

Table 1
Renewable energy sustainable development benefits

Benefits	*Details drawn from the technical expert meeting and relevant submissions*[a]
Economic • Jobs and income generation • Energy security and trade balance • Sustainable economic growth • Cost savings • Technological competitiveness and innovation	The renewable energy (RE) sector created 5.7 million jobs globally (direct and indirect) in 2012 and, according to the global renewable energy road map (REmap) study of the International Renewable Energy Agency (IRENA), doubling RE by 2030 could lead to the creation of 3.5 million associated jobs annually, on average.[b] RE can be especially important for jobs and income generation in rural areas, can lead to various local sourcing and operation and maintenance opportunities and can spur entrepreneurship in various sectors RE can also support energy independence; specifically, a number of Parties noted benefits associated with lessened vulnerability to oil price shocks, enhanced supply security and improved trade balance/foreign exchange savings
Social • Poverty reduction • Energy access • Health improvements	According to IRENA, doubling RE by 2030, and thus significantly reducing local and indoor air pollution, could result in an avoided impact on health worth USD 80–185 billion[b]
Environmental • Climate change mitigation • Climate resilience • Local environmental protection	In addition to climate change mitigation benefits, diversifying the energy sector to include a broader RE portfolio could help to address other national environmental concerns, such as dependence on hydro (and associated environmental impacts) and addressing water scarcity issues to support climate resilience

[a] The benefits presented align with those identified in various presentations and comments made at the technical expert meeting and in the relevant submissions.

[b] *Source*: Presentation made by International Renewable Energy Agency at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

Spotlight box 2
Aligning action with national circumstances and development goals

Ethiopia: Action on renewable energy (RE) in Ethiopia is closely connected with the country's Climate Resilient Green Economy Strategy, which emphasizes economic growth, poverty reduction and adapting to climate change as key development priorities. Importantly, Ethiopia seeks to move from being an agriculturally focused least developed country to a middle-income country with a flourishing industrial sector and zero net carbon emissions. To meet those sustainable development goals, Ethiopia is pursuing a number of RE policies and actions focused on hydro, wind and geothermal development. Hydro currently makes up a large portion of grid-connected RE in Ethiopia; however, to address the adaptation goals noted above, Ethiopia is diversifying its electricity sector to also include wind and geothermal through public and private investments, while also continuing investment in select hydro projects. Another key development goal for the country is to expand energy access, as only 20 per cent of the population is currently connected to the grid. Ethiopia seeks to expand the grid to reach all rural households within approximately 20

years, while currently supporting small-scale off-grid renewables and efficient cook-stove programmes. Ethiopia is also investing in biofuel development and implemented fossil fuel subsidy reform in 2008 to support the expansion of renewables and broader sustainable development goals.[a]

Saudi Arabia: Saudi Arabia's national circumstances are integral to determining the appropriate mix of RE related actions. Namely, the country's demographic, geographical and economic context plays a significant role in its energy-related decisions. In addition to those broader drivers, Saudi Arabia sets its RE-related priorities to align closely with the country's national development goals, related to sustainable economic growth, job creation, economic diversification, adaptation and water security, among others. The Saudi Arabian Government finds that RE-related choices can complement the hydrocarbon sector in working towards development goals. Saudi Arabia considers mitigation to be a co-benefit of sustainable development and adaptation. The country collaborates with national and international institutions to assess and determine appropriate policy and technology choices that align key economic drivers, RE and national development priorities.[b]

[a] *Source*: Ethiopia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

[b] *Source*: Saudi Arabia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

15. According to REN21 (2013), in most countries renewable policy is driven by specific targets and 138 countries had established RE policy targets in 2012, a 27 per cent increase since 2010 (see para. 23 below). More specifically, FiTs, renewable portfolio standards or quota policies, and biofuel mandates have expanded in recent years, with 99 countries, states or provinces implementing FiTs, 76 with quota policies and 76 with biofuel mandates in place in 2012. Such policy actions have contributed greatly to the significant expansion of RE described in chapter II.B.2 of the paper.

16. Despite the significant potential for RE technologies to reduce greenhouse gas (GHG) emissions, and other advancements noted in paragraphs 9 and 10 above, there remain significant gaps in, and formidable barriers to the expansion of, the adoption of policies and actions required to meet the 2 °C goal.[11] While individual barriers must be considered in relation to specific national circumstances, a number of common challenges were identified during the TEM and in Parties' submissions, which are outlined in table 2. Policies and actions to support moving past such barriers are described in chapter II.B below.

Table 2
Barriers to renewable energy diffusion

Barriers	*Details drawn from the technical expert meeting and relevant submissions*[a]
Technical	**Geographical circumstances**
	• Distances between load/demand centres and resource/supply locations
	• Need for tailored or country-specific technologies and research and development to address local conditions (e.g. temperature, dust and sand storms, humidity and other circumstances)
	• Difficult to access certain renewable energy (RE) sites
	Grid reliability and integration of RE
	• Need to address imbalances related to supply and demand and resource variability
	• Need to ensure grid stability and resilience with significant RE integration
	• Need for the strengthened capacity of distribution and load centres
	• Need for access to the grid and priority in dispatching RE from wind and

[11] As footnote 6 above.

Barriers	*Details drawn from the technical expert meeting and relevant submissions*[a]
	solar power

Economic and policy	**Cost/price**
	• In competition with low-cost fossil fuels (especially in relation to subsidies)
	  ○ The International Renewable Energy Agency noted that in 2012 fossil fuel subsidies totalled USD 544 billion, while RE subsidies were approximately USD 101 billion
	• Cost of RE technologies (including operation and maintenance) relating to:
	  ○ High upfront project development costs (especially for geothermal drilling and exploration with high risk)
	  ○ High transaction costs for small-scale RE technologies
	  ○ Difficulty reducing soft costs of RE
	  ○ High cost of technology transfer
	• Need for price certainty of RE over the long term and to address the risk associated with policy change
	Finance/investment
	• Need for affordable upfront finance/lower cost of capital
	• Need for support to prove RE project bankability to investors/funders
	• Need for risk mitigation instruments (especially for geothermal)
	• Long lead time for geothermal power development and contract negotiation
	• Difficulty matching national and donor priorities
	• Need for support of project proposal development
	Manufacturing
	• Need for support of domestic manufacturing and competitiveness

Skills	**Technical** • Need for skilled RE engineers and technicians to support analysis of technology options, planning, installation, maintenance and operation • General lack of access to information **Policymaking** • Need for capacity development to design and implement policy options **Financial** • Need for capacity development to facilitate private investment and negotiate power purchase agreements

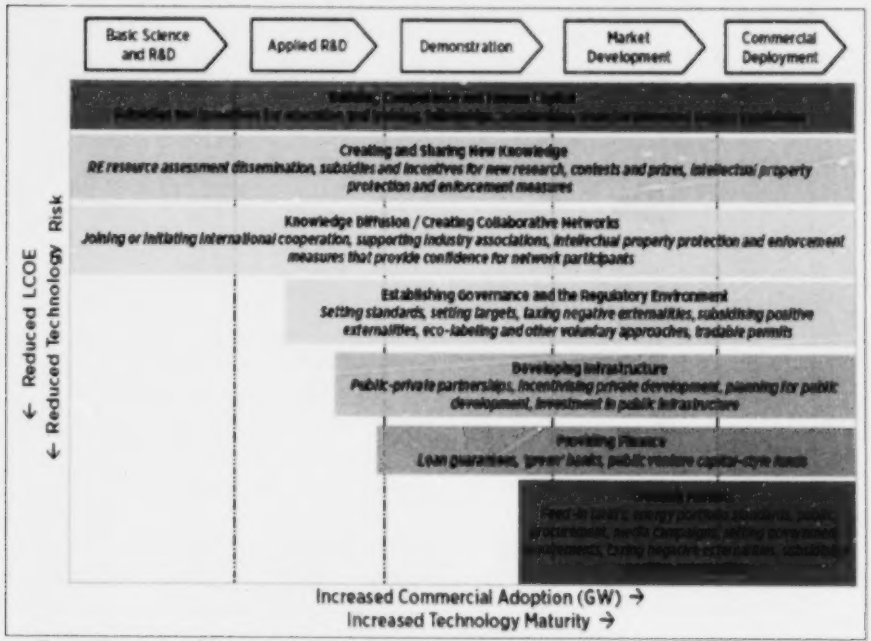
[a] The barriers presented align with those identified in various presentations and comments made at the technical expert meeting and in the relevant submissions.

B. Practices, policies and actions to catalyse renewable energy deployment

17. As can be surmized from the barriers described by Parties during the TEM and in various submisstons (outlined in table 2), tailored and country-specific policy portfolios congruent with national circumstances, and designed to address key barriers, are needed to realize the potential of RE. Country-level planning in relation to RE varies greatly depending on a number of technical, geographical, economic and other capacity-related factors.[12] Therefore, there is no one-size-fits-all approach to supporting RE deployment. IRENA put forward the overarching structure to consider RE-related action on the basis of maturity level or stage of technology deployment presented in figure 6: R&D, applied R&D, demonstration, market development and commercial deployment.

[12] As footnote 6 above.

Figure 6
Framework for action on renewable energy based on technology and maturity level


Basic Science and R&D
Applied R&D
Demonstration
Market Development
Commercial Deployment
Creating and Sharing New Knowledge
RE resource assessment dissemination, subsidies and incentives for new research, contests and prizes, intellectual property protection and enforcement measures
Knowledge Diffusion / Creating Collaborative Networks
Joining or initiating international cooperation, supporting industry associations, intellectual property protection and enforcement measures that provide confidence for network participants
Establishing Governance and the Regulatory Environment
Setting standards, setting targets, taxing negative externalities, subsidising positive externalities, eco-labeling and other voluntary approaches, tradable permits
Developing Infrastructure
Public-private partnerships, incentivising private development, planning for public development, investment in public infrastructure
Providing Finance
Loan guarantees, 'green' banks, public venture capital-style funds
← Reduced LCOE
← Reduced Technology Risk
Increased Commercial Adoption (GW) →
Increased Technology Maturity →

Source: International Renewable Energy Agency. 2013. *Renewable Energy Innovation Policy: Success Criteria and Strategies*.

Abbreviations: LCOE = levelized cost of energy, R&D = research and development, RE = renewable energy.

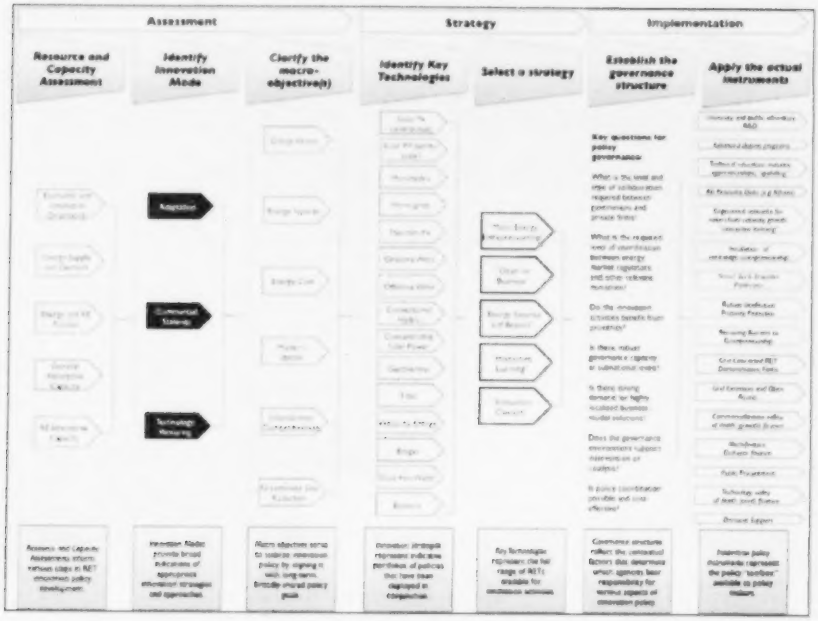
18. A number of countries are pursuing innovative work to support RE diffusion and to overcome the barriers presented in table 2. Successes, challenges and lessons drawn from their activities can be used to inform and inspire similar actions in other countries, customized to national contexts. Policies, initiatives and other actions at the country level, described during the TEM and in various submissions, are highlighted in paragraphs 19–27 below in relation to common policy themes, namely strengthening institutional, legal and regulatory frameworks and designing and implementing effective and multifaceted policy portfolios.

1. Policy theme: strengthening institutional, legal and regulatory frameworks

19. Parties emphasized the need to reinforce institutional, legal and regulatory frameworks that can promote RE through comprehensive and integrated planning. Frameworks that clearly streamline the key planning and implementation stages, with a focus on transparency, accountability and broad stakeholder engagement, as well as the regular and iterative refinement of policies and actions, are crucial. More broadly, the alignment of RE, EE and grid integration measures within an integrated energy transformation framework can help to ensure coordination, efficiency and sustainable outcomes. The policy development process for RE innovation and the key elements of an illustrative planning and implementation framework for RE diffusion as developed by IRENA are presented in figures 7 and 8.

Figure 7

Policy development process for renewable energy innovation



Source: International Renewable Energy Agency. *Guide to Develop Renewable Energy Innovation Policy* (in press).

Abbreviations: PV = photovoltaics, R&D = research and development, RE = renewable energy, RET = renewable energy technology.

Figure 8

Key planning and implementation stages to support renewable energy diffusion

Source: Adapted from World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation.*

20. Building on the integrated framework presented in figure 8, ministerial coordination is also critical in streamlining cross-governmental processes and decisions related to action on RE and in reducing policy overlap and duplication. In some cases, an entity dedicated to RE with a specific directive to support the deployment of RE can help to facilitate broader coordination, oversee actions, increase legitimacy, etc. (World Resources Institute (WRI) and World Wildlife Fund (WWF), 2013). Examples of integrated RE frameworks are presented in spotlight box 3. Streamlining RE-related action with broader low-emission development planning processes can also support coordinated action at the national level, as in the case of Colombia's integration of its Energy Sector (RE and EE) Action Plan with the country's Low Carbon Development Strategy (see spotlight box 7).[13]

Spotlight box 3

Integrated and robust renewable energy frameworks

Germany: Germany's comprehensive energy policy framework "Energiewende" encompasses actions on renewable energy (RE) (through the Renewable Energy Sources Act), energy efficiency (through the Energy Efficiency Directive) and grid transformation (through the Power Line Development Act and Federal Requirement Plan). RE and energy efficiency (EE) related action is also integrated with and supported by the National Climate Initiative and the Market Incentive Programme. Through that three-tiered approach, Germany seeks to expand cost-efficient renewables, significantly reduce energy consumption (by one half) and support grid flexibility and RE integration. Germany is currently on the pathway to achieving the ambitious targets that were set for mitigation, RE and EE by 2020 and 2050. "Energiewende" also incorporates policies, targets and other actions across electricity, heating, transport and research and development. This comprehensive policy approach has led to major successes for the economy and climate. In 2013 RE accounted for approximately 25 per cent of the electricity supply in Germany and led to the mitigation of 147.9 million tonnes of carbon dioxide equivalent. RE is expected to create approximately 600,000 jobs by 2020 and support new entrepreneurship opportunities.[a]

Kenya: Kenya, a country with significant technical RE potential, recognizes the importance of RE diffusion to support energy security, employment and income generation (especially in rural areas), improved trade balance and climate change mitigation. Kenya supports RE through a number of policies and plans, including: the Constitution of Kenya, the Vision 2030 development plan, the National Climate Change Action Plan, the 2006 Energy Act, the Geothermal Resources Act, various feed-in tariffs to support investment in RE, and regulations related to solar water heating, energy management, cook stoves, etc. A number of government institutions support action on those policies and plans, highlighting the need for effective intergovernmental coordination to support RE as well as the need for engagement and coordination with the private sector. Taken as a whole, the policies provide a strong institutional and political framework for RE deployment in the country. The mix of policies and plans also highlights the need for a portfolio of actions, rather than reliance on a single 'silver bullet' to support robust RE deployment.[b]

Philippines: The Philippines adopted a long-term Energy Plan that integrates RE-related actions with broader resource planning and supports key national priorities focused on energy security and sustainable development. In alignment with the Energy Plan, the Renewable Energy Act and National Renewable Energy Programme seek to triple RE capacity to 15,304 MW by 2030. The Philippines' Renewable Energy Act is also closely aligned with the country's broader Climate Change Act and National Climate Change Action Plan for 2011–2028, supporting integrated and coordinated action across the

[13] ADP TEM on RE, Colombia's presentation, 2014.

Government.[c]

[a] *Source*: Germany's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.
[b] *Source*: Kenya's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.
[c] *Source*: World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.

2. Policy theme: designing and implementing effective and multifaceted policy portfolios

21. Participants in the TEM described various policies to support RE deployment, including: (a) RE targets and quotas; (b) pricing policies, such as feed-in tariffs (FiTs), carbon pricing and establishing price stabilization funds; (c) fiscal incentives, such as direct RE subsidies and tax credits; and (d) grid integration measures. Although not considered in great detail during the TEM, other key RE policies to support RE diffusion include support for tradable RE certificates and net metering.

22. Across policy options, Parties emphasized the need for flexible design to ensure that market and technology changes inform refinements and adjustments, also requiring nimble and flexible institutions to respond to changes and ensure efficiency. Also, to ensure broad public acceptance and support, the benefits of policies to support the scaling up of RE should be clearly and compellingly presented to stakeholders and the public to ensure sustained support and successful outcomes (WRI and WWF, 2013). In addition, Parties highlighted the need for timely, integrated, tailored and affordable financial support, both to design and implement effective policies.

23. **Renewable energy targets**: As a key element of broader RE planning frameworks, Parties emphasized the need to establish effective RE targets that send stable policy signals and support long-term deployment goals. WRI and WWF analysed seven case studies of countries implementing RE targets and proposed key policy, institutional, social, technical and infrastructure factors to ensure targets are achieved. Those factors are presented in figure 9. Successful actions supporting RE targets at the country level are presented in spotlight box 4.

Figure 9
Key elements to support successful renewable energy targets

Source: World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.
Abbreviations: HR = human resources, R&D = research and development.

Spotlight box 4

Renewable energy targets and policies implemented to meet them

China: China currently has the greatest installed renewable energy (RE) capacity in the world, with 556 GW in 2012 (increasing by 13 per cent between 2000 and 2012), and expects to build on that success with a target of 15 per cent non-fossil primary energy by 2020. To that end, China established a portfolio of laws and regulations under its Renewable Energy Law, which includes national RE targets, mandatory RE grid access, electricity pricing policies and special RE funds. The law is complemented by a number of actions, including annual RE plans and goals, distributed and off-grid RE for rural areas, and pilot projects. RE policies in China couple both incentives and standards to support RE deployment, such as feed-in tariffs, technical codes for solar water heaters and biodiesel blend standards. China's policy portfolio resulted in a doubling of emission reductions associated with RE between 2005 and 2012.[a]

European Union: The European Union's 2020 Climate and Energy Package sets out the 20-20-20 targets to reduce greenhouse gas emissions by 20 per cent (from the 1990 level), increase RE consumption by 20 per cent and improve energy efficiency (EE) by 20 per cent by 2020. To support key development goals, the RE and EE targets are projected to produce approximately 817,000 jobs by 2020. To achieve these targets, the European Union is supporting four key legislative actions: the reform of the European Union Emissions Trading System (EU ETS); national targets to reduce emissions not covered by the EU ETS (such as those from agriculture, housing, waste and transport); national RE targets; and carbon capture and storage. In addition, the European Union has offered to reduce emissions even more significantly (up to 30 per cent) given similar commitments by the international community.[b]

Marshall Islands: In 2009 the Marshall Islands was 90 per cent dependent on imported fossil fuel, representing 20 per cent of the national budget expenditure and leading to an energy crisis that year. To address that key national challenge, the National Energy Policy was adopted, leading to incremental, yet significant, progress over the next five years. Specifically, the outer island solar project set a target of 100 per cent RE electrification and resulted in 95 per cent solar electrification of all outer island public facilities and households. Building on that success, the country adopted a target for the rest of the island of 20 per cent RE electrification by 2020 from solar photovoltaics, biofuels and wind energy, with a major focus on grid-connected solar. The country is making significant progress towards meeting that target.[c]

[a] *Source*: China's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

[b] *Source*: See <http://ec.europa.eu/clima/policies/package/index_en.htm>.

[c] *Source*: The Marshall Islands' presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

24. **Feed-in tariffs**: Many countries have adopted FiTs to support RE deployment, often in combination with other RE policies, such as tax incentives and RE quotas, which are generation-based, quantity-driven policy instruments. To be successful, FiTs must complement existing policies and take into account various national drivers and support high-level policy goals. Tariff differentiation and setting are key elements in designing an effective FiT and should be aligned with overall policy goals and considerations relating to cost, energy access, economic development, price stability and diversification of power supply, among others (UNEP, 2012). Funding of FiTs is also an area of critical importance, especially in developing countries. The Third World Network has proposed a globally funded programme, under the What Next Forum, to support the design and implementation of FiTs.[14] The proposal highlights the need for both grid-connected as well as innovative decentralized energy provision models and presents a structure to

[14] ADP TEM on RE, presentation by the What Next Forum, March 2014.

finance the programme under the Green Climate Fund (GCF) in partnership with a number of implementing agencies.

Spotlight box 5

Innovative renewable energy policies

The United Kingdom of Great Britain and Northern Ireland has a legally binding commitment to reduce its greenhouse gas emissions by 80 per cent by 2050. Renewable electricity production is expanding rapidly to help meet that commitment, with 350 per cent growth from 2003 to 2012. However, even in the light of such rapid expansion, there is still a need for massive investment in the renewable energy (RE) sector to meet mitigation and energy security goals under the Electricity Market Reform Programme. The United Kingdom established an innovative pricing mechanism called Contracts for Difference (CfD) to reduce investment risk associated with RE projects by providing greater stability and certainty in relation to revenue. The mechanism allows RE generators to receive a fixed or 'strike' price for RE electricity production. Under that approach, revenues are stabilized within a predetermined range for the period of the contract and when the electricity market price is higher or lower than the strike price the generator either receives the difference in payment or pays back the difference. The CfD structure increases efficiency by addressing market issues associated with bidding electricity when market prices are negative and supports revenue certainty for the generator, thus addressing key economic barriers to RE deployment.

Sources: The United Kingdom's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014; and Department of Energy & Climate Change. 2012. *Annex: Feed-in Tariff with Contracts for Difference: Operational Framework*.

25. **Tax incentives**: Tax incentives, including industry, production, personal, property and sales tax credits and deductions, accelerated depreciation and income tax holidays for the first few years can help to reduce the burden of high upfront capital costs of RE projects and should be aligned with higher-level RE goals and available financial resources. In addition, tax incentives can reduce overall investment risk and support the uptake of new RE technologies. In many cases, new jobs created by RE projects can help to offset revenue losses related to tax rebates. They can also make RE sources competitive compared with other sources of energy, which have been subsidized. As technologies become more commercially viable, incentives can be reduced and ultimately phased out over time (Renewable Energy and Energy Efficiency, 2010).

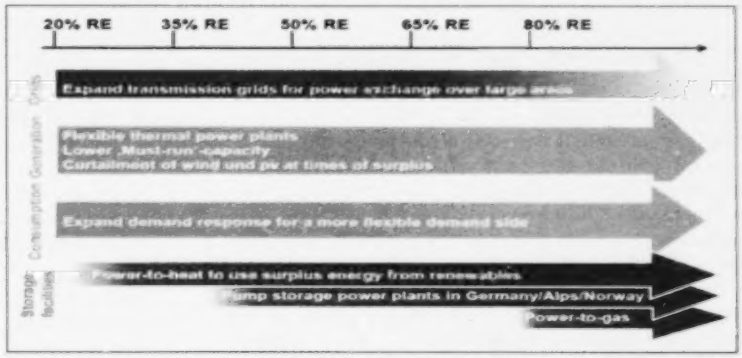
26. **Grid integration measures**: Parties highlighted the need for action and policies to ensure grid stability, flexibility and resilience with the increasing integration of RE. As noted in paragraph 19 above, grid integration and access measures should be integrated within broader RE frameworks, as early planning for grid integration infrastructure and technical requirements, such as transmission and distribution needs, forecasting and storage technologies, etc., can help to ensure-long term sustainable outcomes. On the basis of countries' experiences, Cochran et al. (2012), IEA (2013) and other studies have identified best practices for RE grid integration, including the case described in spotlight boxes 5 and 6.

Spotlight box 6

Grid integration action to support high-penetration renewables

Germany: Under Germany's Renewable Energy (RE) Sources Act, RE is guaranteed grid access and given priority for transmission and distribution. Grid access is supported by technology-specific 20-year feed-in tariffs, with grid operators equalizing additional costs associated with RE electricity across all electricity consumers (excluding energy-intensive industries). Monitoring and evaluation play a key role in assessing the performance of the Renewable Energy Sources Act. Given the success thereof, Germany

highlighted electricity system volatility as a major challenge for the future, as RE is expected to meet nearly 100 per cent of electricity demand by 2022. To address that challenge, Germany is investing in innovative measures to increase flexibility in electricity system supply and demand. Such measures are highlighted in the graphic below.



Source: Germany's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

27. Several policy options to address barriers, as well as key actions to support successful policy replication and implementation, are highlighted in table 3, which also includes information on some country-specific examples. A few noted policies described during the TEM are highlighted in spotlight boxes 3–6.

Table 3
Renewable energy policy menu (for select policy options and examples highlighted during the technical expert meeting and in relevant submissions)

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
Policy option: High-level policy frameworks and integrated action plans	
• **Establish integrated, transparent and stakeholder-driven approaches**, including: setting a vision and objectives; assessing resources and potential; identifying barriers; establishing targets; evaluating, designing and implementing policies and actions; and reviewing and refining the overall process, policies and actions • **Iterate and refine** policies and actions to ensure learning and good practices are captured and weaknesses are addressed • **Support coordination** to streamline cross-governmental processes and decisions related to action on renewable energy (RE) and reduce policy overlap and duplication • **Consider an agency dedicated to RE** to support RE deployment by facilitating broader coordination, overseeing actions and increasing legitimacy • **Monitor and evaluate** RE-related actions within broader frameworks to support improvements over time and attract international finance	• China – Comprehensive Workplan for Energy Conservation and Emission Reduction during its Twelfth Five-Year Plan period • Colombia – Low Carbon Development Strategy • European Union – European Union Climate and Energy Package • Indonesia – National Action Plan for Reducing Green House Gas Emissions • Kenya – National Climate Change Action Plan for 2013–2017 • Philippines – Climate Change Act and National Climate Change Action Plan for 2011–2028 • United Kingdom – Low Carbon

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
	Transition Plan: National strategy for climate and energy • United States – The President's Climate Action Plan
Policy option: RE targets (quotas and renewable portfolio standards)[a, b]	
• **Engage stakeholders** to support initial target design and plan for regular consultation and feedback • **Determine policy goals and analyse and model policy impacts** to ensure goals are met on the basis of resource availability, transmission and distribution, siting considerations and complementary policies (at the national and subnational levels) • **Identify technologies to be included in the policy** by assessing social impacts, determining which technologies are proven, but not yet widely deployed, and defining geographical territories for inclusion and treatment of central and distributed generation • **Set effective and achievable targets** by including eligible technologies, developing tiers for higher-cost technologies, establishing a time frame that supports long-term finance and contracting, rather than relying primarily on short-term RE certificate markets, and monitoring compliance by providing clear guidance on accounting systems and payments, as well as a system to redistribute non-compliance payments (e.g. RE Fund) • **Establish a tradable Renewable Energy Credits (REC) system** to support flexibility and market-based approaches for compliance. REC systems can also reduce compliance and administrative costs and simplify verification processes • **Other enabling actions** include: verifying available resources through detailed geospatial and resource assessments; ensuring transmission access for RE; and establishing complementary mechanisms to support finance, such as power purchase agreements and other contractual arrangements for project finance	• China – 20 per cent share of RE in electricity production by 2015 • European Union – 20-20-20 targets • Germany – at least a 35 per cent share of RE in electricity production by 2020 • India – 17 per cent share of RE in electricity production by 2017 • Marshall Islands – 100 per cent RE electrification for outer island and 20 per cent RE electrification for whole island • Morocco – 42 per cent share of RE in electricity production by 2020 • Philippines – 40 per cent share of RE in electricity production by 2020 • South Africa – 30 per cent share of RE in electricity production by 2020 • Spain – 38 per cent share of RE in electricity production by 2020
Policy option: FiTs[c]	
• **Conduct robust analyses** to ensure policy aligns with and meets overall goals (e.g. rapid RE deployment to meet targets, emission reduction, job creation, minimizing policy cost, etc.), especially given complexity associated with design of FiTs • **Design effective policies** by: basing payments on cost of RE generation and setting tariff prices in relation to technology, location, resource availability and size of the project; guaranteeing RE access to the grid; including eligibility for project developers and end-users; ensuring electricity generated has a 'must-take' provision; and supporting the long term stability of the policy • **Determine approach to financing FiT**; some options include: integrating costs directly with the electricity rate; use of tax revenues; a combination of the two aforementioned options; and leveraging carbon auction revenues. Cost sharing is another important consideration and spreading costs across utilities and regions can support efficient outcomes • **Ensure policy flexibility, as well as predictable and gradual adjustments** in relation to advancements in technology, evolving markets, and other considerations that often require adjustments to the short-term FiT payment level and assessment of the long-term	• Germany – Renewable Energy Sources Act – technology-specific 20-year FiTs • Kenya –FiT regime for geothermal, wind, small hydro, biomass, biogas and solar-generated electricity • United Kingdom – Contracts for Difference • Various state FiTs in the United States (Hawaii, Vermont, California, etc.)

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
programme design. Leadership by policymakers is often integral to ensuring the flexibility and overall efficiency of the policy. However, policy adjustments should be incremental and predictable and avoid volatility or quick reactions.	
Policy option: Tax incentives (industry/production, personal, property and sales)[c, d]	
• **Strong political leadership** is required to communicate to the public the broader economic development benefits associated with tax incentives (e.g. jobs, new enterprises, etc.), given tax revenue implications • **Design of tax incentives** should: ensure that the size of the incentive is adequate to attract private-sector interest, but not overly burdensome on the tax revenue base; have a long enough time-horizon to provide a significant market signal, but also be flexible in supporting reductions over time; include consumer education and marketing approaches related to return on investment; and include the development of a plan to review the effectiveness of the tax incentive programme	• Cameroon – removal of value-added tax for RE technologies • India – removal of import taxes for concentrating solar power technologies • Ireland – corporate tax deductions for investment in RE • Nicaragua – tax exemption for carbon bond sales and for RE operations (five-year maximum) • United States – Production Tax Credit
Policy option: RE grid integration measures[c, f]	
• **Facilitate and ensure public engagement** to inform grid integration actions, with an emphasis on engagement for planning new transmission taking into account overall grid expansion objectives and distribution of costs and benefits; siting locations (stakeholders can provide valuable information that could affect RE siting but may not be included in public records); transmission routing options; regulatory approach associated with projects; and expansion, among many other possible areas of interest • **Integrate processes to ensure planning efficiency across the grid network** to streamline transmission, generation and system actions. At the geographical level, subnational institutions (local and regional) often have grid planning processes that can be built upon to ensure coordination and integration across actors and locations • **Consider increasing RE resource area through** grid extension to access remote and diverse RE resources, and expanding energy trade opportunities can help address resource variability constraints • **Enhance power system operations** through actions such as adapting dispatch rules for the market and power plant to accommodate increasing RE integration and adopting advanced forecasting methods • **Support system flexibility** through actions such as: reforming scheduling and dispatch intervals to occur subhourly; designing capacity markets where there are issues related to decreases in wholesale electricity prices; and implementing zonal or nodal pricing schemes that can address congestion issues and support new resource development, among many others. In addition, storage, demand response and smart grid options can further support flexibility through shifting load, balancing and frequency measures	• Germany – grid integration actions under the Renewable Energy Sources Act • Mexico – engagement in 21st Century Power Partnership under the Clean Energy Ministerial • South Africa – engagement in 21st Century Power Partnership under the Clean Energy Ministerial • United States – systems and grid integration analysis under the SunShot Initiative

Note: This policy menu should be complemented by the information on cooperative initiatives presented in box 2 in the main text of this updated technical paper and information on additional initiatives presented on the portal on cooperative initiatives, which is available at <http://unfccc.int/focus/mitigation/items/7785.php>.

[d] *Source*: Renewable Energy and Energy Efficiency Partnership, Alliance to Save Energy and American Council On Renewable Energy. 2010. *Compendium of Best Practices: Sharing local and state successes in energy efficiency and renewable energy from the United States*.

[3] *Source*: Various examples drawn from World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.

[4] *Sources*: Cochran J, Bird L, Heeter J and Arent D. 2012. *Integrating Variable Renewable Energy in Electric Power Markets: Best Practices from International Experience*. National Renewable Energy Laboratory, Joint Institute for Strategic Energy Analysis, Clean Energy Solutions Center and Clean Energy Ministerial, and Couture T, Cory K, Kreycik C and Williams E. 2010. *A Policymaker's Guide to Feed-in-Tariff Policy Design*. National Renewable Energy Laboratory.

[5] *Source*: Renewable Energy Policy Network for the 21st Century. 2013. *Renewables 2013: Global Status Report*.

[6] *Source*: Key actions adapted from Cochran J, Bird L, Heeter J and Arent D. 2012. *Integrating Variable Renewable Energy in Electric Power Markets: Best Practices from International Experience*. National Renewable Energy Laboratory, Joint Institute for Strategic Energy Analysis, Clean Energy Solutions Center and Clean Energy Ministerial.

[7] *Source*: International Energy Agency. 2013. *World Energy Outlook 2013*.

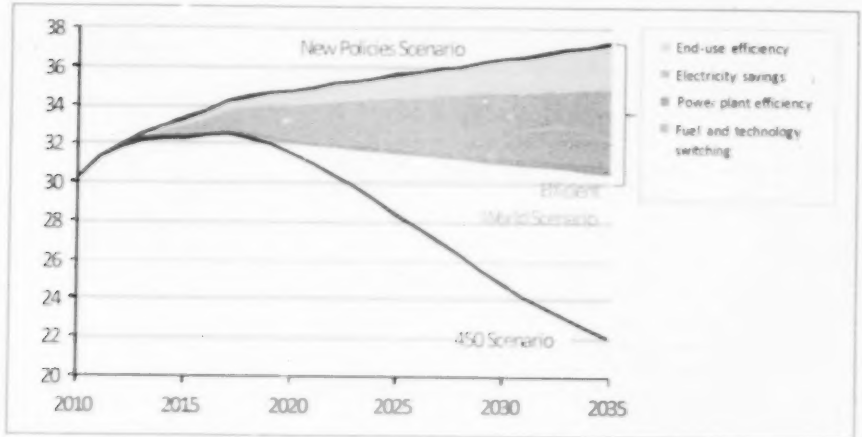
III. Technical summary on energy efficiency

A. Potential, progress, benefits, costs and barriers

28. As described in its 450 Scenario, IEA (2013a) estimates that by 2020 action on EE could lead to approximately 1.5 Gt CO_2 eq emission reductions (approximately half of the emission reductions under the 450 Scenario). Specific EE-related actions included in the scenario are presented in figure 10.

Figure 10

Action on energy efficiency and emission reductions under International Energy Agency scenarios



Source: International Energy Agency. 2013. *World Energy Outlook Special Report 2013: Redrawing the Energy-Climate Map*.

29. The UNEP *Emissions Gap Report 2013* found that significant EE-related actions could result in emission savings of approximately 2 Gt CO_2 eq per year by 2020, with action focused on buildings (accounting for 0.6 Gt CO_2 eq per year), removal of incandescent light bulbs (accounting for 0.5 Gt CO_2 eq), energy-efficient electrical appliances (0.6 Gt CO_2 eq) and vehicle efficiency improvements (0.7 Gt CO_2 eq) (Blok et al., 2013). UNEP (2013) also found that there are currently 25 key initiatives that could support expanded action in this sector.

30. Large investments[15] in EE are significantly contributing to reducing energy demand, as demonstrated in 11 countries where EE-related actions led to 570 Mtoe avoided energy

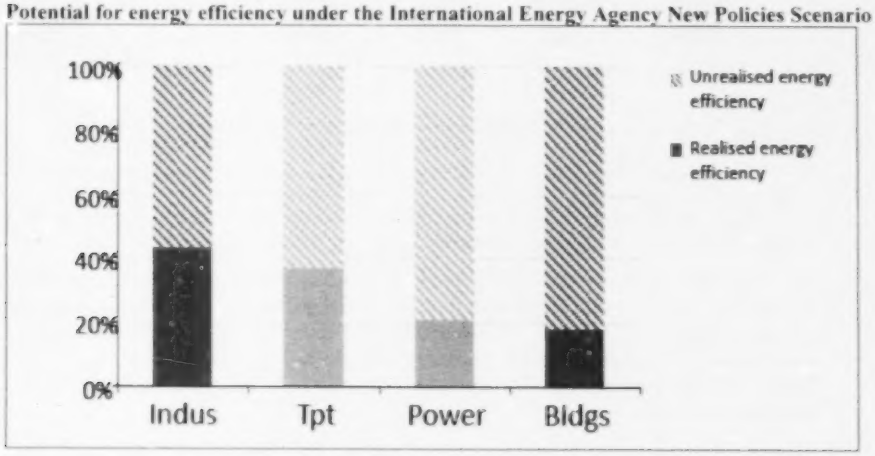
[15] In 2011 IEA estimated USD 300 billion in total investments in EE globally.

consumption, or approximately USD 420 billion in savings,[16] from 2005 to 2010 (IEA, 2013c). However, despite such promising trends, global investments in EE are still approximately one third lower than fossil fuel subsidies, and investments are unevenly distributed across countries and economic sectors.

31. Given the often low or negative net costs and short payback periods, EE-related actions are widely seen as low-hanging fruit when compared with other mitigation options (IEA, 2013a). Generally, technologies with a three- to four-year payback period can achieve around 30 per cent energy savings (International Institute for Applied Systems Analysis, 2012; and UN-Energy, 2009). There are significant opportunities to expand EE-related action and capture those cost benefits, as two thirds of the economic potential of EE (up to 2035) remains unrealized (IEA, 2013b) (see figure 11). Scaled-up investment in EE-related action could also greatly benefit the global economy, supporting a possible increase of USD 18 trillion in cumulative global economic output by 2035 (IEA, 2012).

Figure 11

Potential for energy efficiency under the International Energy Agency New Policies Scenario



Source: International Energy Agency. 2013. *World Energy Outlook 2013*.
Abbreviations: Bldgs = buildings, Indus = industry, Tpt = transport.

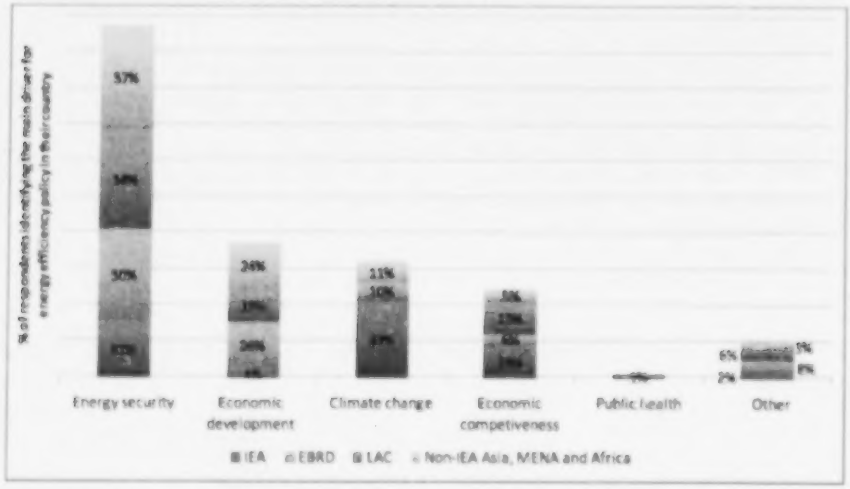
32. As noted by various Parties, alignment with national development goals is a critical component of planning EE-related action. EE can induce various benefits beyond energy savings. Key benefits highlighted during the TEM and in submissions include: cost savings associated with electricity and fuel expenditure; energy security; trade benefits associated with decreased energy imports or expanded energy exports; economic development and job creation; diversion of investment to other sectors as a result of energy savings; improved energy system stability and resilience; improvements in health and well-being; and reductions in GHG emissions and other pollutants, among others.[17] Figure 12 presents key development drivers associated with EE-related activities for a sample of countries surveyed by IEA.

[16] Assuming USD 100/barrel.

[17] The benefits noted align with those identified in various presentations and comments made at the TEM and in relevant submissions.

Figure 12

Development drivers for action on energy efficiency



Source: International Energy Agency. 2010. *Roundtable Panel Discussion: Coordinating Energy Efficiency Policy Delivery.*

Abbreviations: EBRD = European Bank for Reconstruction and Development, IEA = International Energy Agency, LAC = Latin America and the Caribbean, MENA = Middle East and North Africa.

33. Parties described a number of barriers and challenges to realizing the potential for EE during the TEM. Innovative national-level action supported by international partnerships and collaboration will be crucial in addressing technical, economic, policy and other capacity-related challenges specific to each country. However, while identifying and tailoring solutions to address barriers is largely country-specific, a number of Parties identified common barriers to EE, which are presented in table 4.

Table 4

Barriers to energy efficiency

Barriers	*Details drawn from the technical expert meeting and relevant submissions*[a]
Technical	• Costs and benefits associated with energy efficiency (EE) policies differ across segments of the population (especially in relation to buildings) • The research and development of EE technologies needs to be aligned with national circumstances
Economic and policy	**Policy and pricing** • Need for greater emphasis on EE as a key priority at the national policy level • Need for cost-reflective energy pricing (especially in countries with fossil fuel subsidies), energy tariffs to support EE-related action and market organization reform • Difficulty integrating EE policies and actions with sectoral planning processes • Supply-side investment is often favored by policymakers **Consumer behaviour and awareness** • Consumer behaviour often leads to short-sighted purchasing and investment patterns and further financial incentives are needed to promote choosing EE • Information on and awareness of the benefits of EE is lacking and there is a perceived risk associated with EE technologies
Financial	• High upfront capital costs for project development and a perceived risk associated with EE technologies

Barriers	*Details drawn from the technical expert meeting and relevant submissions*[a]
	• Need for expanded awareness of the financial benefits of EE for financial institutions • Large-scale financing is difficult to access, especially for expensive technologies that could lead to the replication of large-scale and impactful successes
Institutional	• Lack of effective coordination among the many government ministries that may be engaged in EE-related activities
Skills	• Constraints on the capacity to support EE-related action, for example for initial data collection, analysis of the costs and benefits of opportunities for EE, planning (economy-wide and sectoral), designing and implementing effective policies and supporting finance • Need for country-specific benchmarking of energy-use patterns and technology performance • Need for the development of energy servicing companies to support the diffusion of EE technologies

[a] The barriers presented align with those identified in various presentations and comments made at the technical expert meetings and in the relevant submissions.

B. Practices, policies and actions to catalyse energy efficiency improvements

34. Successful and innovative actions to support the diffusion of EE technologies are occurring around the world and a number of high-quality examples were highlighted during the TEM and in Parties' submissions. The replication of successes offers much promise and Parties emphasized the need to share successes, challenges and lessons learned from their experiences to support such replication.

35. As presented in table 5, IEA highlighted 25 policy recommendations to vastly scale up EE by addressing the barriers noted in chapter III.A above. Taken as a whole, and if implemented globally, the policies could lead to 7.6 Gt CO_2 eq emission reductions per year by 2030 (IEA, 2011b). Country-specific examples highlighting experiences in and lessons learned from implementing such policies are presented in spotlight boxes 7 and 8.

Table 5
International Energy Agency policy recommendations

Category	*Policies*
Cross-sectoral	• Collection of data on energy efficiency (EE) and indicators • Strategies and action plans • Competitive energy markets with appropriate regulation • Private investment in EE • Monitoring, enforcement and evaluation of policies and measures
Buildings	• Mandatory building energy codes and minimum energy performance requirements • Aiming for net zero energy consumption in buildings • Improving EE of existing buildings • Building energy labels or certificates • Improved energy performance of building components/systems
Appliances and equipment	• Mandatory minimum energy performance standards and labels for appliances and equipment • Test standards and measurement protocols for appliances/equipment • Market transformation policies for appliances and equipment
Lighting	• Phase out of inefficient lighting products and systems • Energy-efficient lighting systems

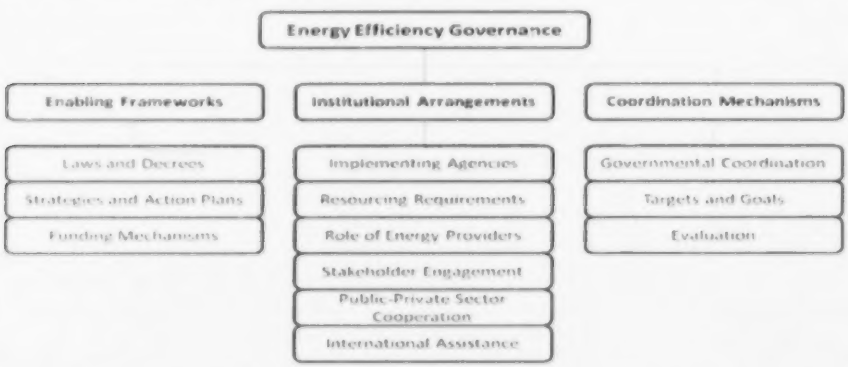
Category	*Policies*
Transport	• Mandatory vehicle fuel efficiency standards • Measures to improve vehicle fuel efficiency • Fuel-efficient non-engine components • Improved vehicle operational efficiency • Eco-driving and other measures • Transport system efficiency
Industry	• Energy management in industry • High-efficiency industrial equipment and systems • EE services for small and medium enterprises • Complementary policies to support industrial EE
Utilities/end-use	• Energy utilities and end-use EE

Source: Adapted from the presentation made by the International Energy Agency at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

36. Aligned with the policies noted in table 5, Parties described various EE-related actions that they are currently undertaking. Parties highlighted the need for a suite of actions, as there is no single 'one-size-fits-all' approach or 'silver bullet' that can address all barriers to EE. Policy portfolios or combinations of actions are required, including high-level policy frameworks, regulations, economic incentives, knowledge and information dissemination, and support for changes in consumer behaviour.

37. To move from discussing the potential for EE to realizing action, Parties emphasized the importance of a number of broader policy themes. Firstly, significantly scaling up EE-related action must be a key high-level policy priority, with government leadership playing an integral role in promoting EE at all levels. Also, effective coordination between ministries engaged in EE-related action, as well as partnership and collaboration between national and subnational governments and the public and private sectors, are critical components for success. Finally, multifaceted policy portfolios are necessary to ensure economy-wide and robust action. Those higher-level policy themes are highlighted in chapters III.B.1 and III.B.2 below. Figure 13 captures the themes, along with additional key areas of support for effective governance of EE.

Figure 13
Key elements of energy efficiency governance structures



Source: International Energy Agency. 2010. *Roundtable Panel Discussion: Coordinating Energy Efficiency Policy Delivery.*

1. Policy theme: strengthening institutional, legal and regulatory frameworks

38. While the private sector has a key role to play in implementing EE-related activities, the public sector plays an equally important role in promoting EE by designing policies and developing incentives for private-sector uptake. Building on public and private leadership, broader EE frameworks that combine policy, regulatory and financial actions from the long-term perspective are necessary to create an enabling environment for the significant diffusion of EE technologies and measures. Diverse stakeholder engagement and input for the development of such policy frameworks is crucial to ensure broad support and sustainable outcomes.

39. Public-sector stakeholders, crucial for EE-related action, are often dispersed throughout the government within different ministries and entities, creating a need for consistent and transparent coordination. Effective coordination can support the replication of successful EE-related actions across government agencies, as well as the integration and capture of synergies across related initiatives, for example across EE, climate change and low-emission development programmes. For example, South Africa emphasized the need for ministerial coordination to support the country's National Energy Efficiency Strategy (NEES), which set a target of a 12 per cent improvement in EE by 2015. South Africa described a number of government agencies engaged with EE-related actions, including: the Ministry of Energy (leading NEES); the Department of Trade and Industry (Industrial Action Policy Plan); the Economic Development Department (New Growth Path Framework); the Department of Environmental Affairs (Climate Change Response Policy White Paper); the Department of Public Enterprise; the national power utility Eskom; and local and subnational governments that have significant responsibility for the provision of energy services under the constitution, among others. Given the number of government actors engaged, South Africa's experience highlights the need for effective and robust ministerial coordination.[18] France and Portugal provide two other examples of cross-government coordination effort between the central and local governments in the case of France, and between several sectoral ministries, as in the case of Portugal, to address EE-related considerations across the entire economy.[19] Additional examples are described in spotlight box 7.

40. As part of a broader institutional framework for EE, Parties emphasized the need for the regular monitoring and evaluation (M&E) of EE-related actions and initiatives under way in order to inform the prioritization of EE programmes, policy iteration and improvements over time. As a prerequisite for effective M&E, the collection of data on energy use is required at the national and sectoral levels to support benchmarking and other M&E processes. As noted by India, the benchmarking of energy-use patterns and technology performance must occur at the country level and in relation to local circumstances.[20] M&E is also crucial to ensure compliance with EE policies and regulations. However, M&E of EE policies can be very challenging and may require international support to ensure investors do not feel overwhelmed in relation to M&E requirements and processes.[21]

41. Finally, Parties also noted that, despite the market success of a number of EE technologies, there is still a need for further innovative R&D of new and improved products, especially products that are tailored to national circumstances. As presented in spotlight box 7, Japan is currently implementing R&D of high-performance heat pumps, among other technologies, within its broader EE policy framework.[22]

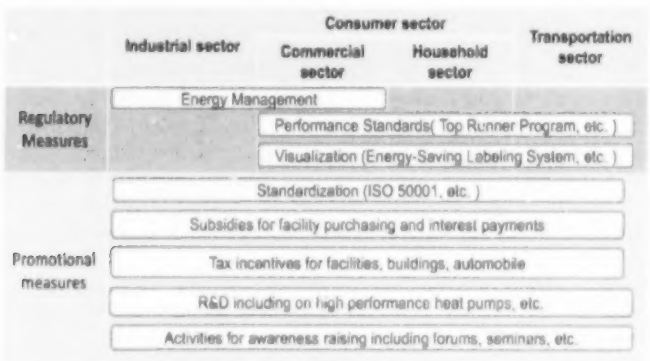
[18] ADP TEM on EE, South Africa's presentation, 2014.
[19] Submission made by the European Union in 2014 under ADP workstream 2.
[20] ADP TEM on EE, India's presentation, 2014.
[21] ADP TEM on EE, presentation by UNEP, 2014.
[22] ADP TEM on EE, Japan's presentation, 2014.

Spotlight box 7

Comprehensive national energy efficiency policy framework

Colombia: The Colombian National Development Plan highlights the need for reliable, high-quality and environmentally sustainable energy provision to support economic development. Aligned with that overarching priority, Colombia's comprehensive energy efficiency (EE) policy Programme on Rational and Efficient Use of Energy and Other Forms of Non-Conventional Energy supports a number of EE-related actions in the residential, industrial, transport, commercial and public sectors. EE-related activities in Colombia are also closely aligned with the country's Low Carbon Development Strategy (ECDBC) and, specifically, the Sectoral Mitigation Action Plan (SMAP) for the electricity sector. In relation to EE, the action plan focuses on both demand-side EE and the efficiency of the national energy system. Integration of EE-related actions with ECDBC and SMAP helps to facilitate cross-ministerial and collaborative support for EE-relation action and to ensure alignment with the country's broader development and climate goals.[a]

Japan: Oil crises in the 1970s led Japan to take significant action on EE, resulting in a 40 per cent improvement in EE (based on primary energy use per unit of gross domestic product) and making Japan a global leader in EE. Japan's Energy Conservation Policy (presented in the graphic below) provides a strong example of a comprehensive set of actions to support EE, combining regulatory and incentive-based measures. The private sector is central to the framework, as policies are designed to ensure business action through minimum energy performance standards, namely the Top Runner Program, requirements to designate energy managers, and regular reporting, among other actions. Peer pressure among private entities has also played a major role in supporting successful outcomes.[b]


Consumer sector
Industrial sector
Commercial sector
Household sector
Transportation sector
Regulatory Measures
Energy Management
Performance Standards(Top Runner Program, etc.)
Visualization (Energy-Saving Labeling System, etc.)
Promotional measures
Standardization (ISO 50001, etc.)
Subsidies for facility purchasing and interest payments
Tax incentives for facilities, buildings, automobile
R&D including on high performance heat pumps, etc.
Activities for awareness raising including forums, seminars, etc.

[a] *Source*: Colombia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

[b] *Source*: Japan's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

Abbreviations: ISO = International Organization for Standardization, R&D = research and development.

2. Policy theme: design and implementation of effective and multifaceted policy portfolios

42. Rather than depending on one 'silver bullet', Parties emphasized the need for EE policy portfolios that integrate various policies, such as standards and labeling (S&L), incentives, pricing policies, R&D and M&E. Key policies are described in paragraphs 43–50 below, while successful policies, which combine various policies, are highlighted in spotlight boxes 7 and 8.

43. **Standards and labelling**: More than 75 countries currently have S&L policies in place (Collaborative Labeling and Appliance Standards Program (CLASP), 2011). Parties emphasized the need to scale up such programmes to support the rapid deployment of EE technologies. UNEP found that support for efficient appliances and equipment through S&L programmes and other actions could potentially result in 1.25 Gt CO_2 eq annual emission savings globally.[23] As presented in spotlight box 8, India introduced a voluntary labelling initiative for refrigerators and air conditioners and has since made labelling mandatory for four products. India emphasized the importance of robust marketing and outreach to raise public awareness of the benefits and 'superiority' of energy-efficient appliances, which contributed to the success of the programme.[24] Building on that point, to complement S&L programmes, a number of TEM participants emphasized support for forums, seminars and other learning initiatives and marketing campaigns to raise consumer awareness of the benefits of EE. Drawing on research conducted by CLASP and, specifically, successful activities in Ghana, best practices associated with designing S&L programmes are highlighted in table 6.

44. **Minimum energy performance standards**: In addition to S&L programmes, Parties specifically highlighted minimum energy performance standards for buildings, appliances and vehicles as key policy actions to support EE. Notable examples include Japan's Top Runner Program, presented in spotlight box 7, support for various programmes for the phasing out of incandescent light bulbs through the UNEP en.lighten initiative, and various measures to support fuel efficiency standards.

45. **Fuel efficiency standards:** The Global Fuel Economy Initiative (GFEI) set a target to reduce fuel consumption by half in 2050. Meeting that target could lead to the stabilization of global CO_2 emissions from light vehicles, even with the projected number of vehicles expected to double during that time period.[25] UNEP also noted that reducing vehicle fuel consumption by 50 per cent could lead to more than USD 300 billion in annual oil import bill savings by 2025 and USD 600 billion by 2050.[26] TEM participants and various submissions described the best practices to support fuel efficiency (see table 6).

46. **Efficient lighting:** According to UNEP, potential global emission benefits related to lighting standards and phase-out programmes could lead to 490 Mt CO_2 eq emission reductions annually (assuming all inefficient light bulbs are replaced globally).[27] Lighting programmes are also very cost-effective. For instance, and as described by UNEP, a country similar to India could save approximately USD 2.6 billion through electricity savings (with a nine-month payback period) if EE lighting programmes were fully implemented in all sectors.[28]

47. **Incentives and subsidies**: Despite the economic feasibility of many investments in EE, further financial incentives are required to ensure the widespread diffusion of technologies. For instance, India noted that payback periods of two to five years for EE technologies are the most effective at voluntarily attracting consumer uptake, while payback periods beyond five years often require further incentives. Examples of financial incentives include rebates and discounts for the purchase of appliances, vehicles and buildings, while non-financial incentives may include technical assistance, training and information dissemination (United States Environmental Protection Agency, 2010).

48. **Pricing policies:** Price signals also play a key role in encouraging the uptake of EE technologies and practices by consumers. Emissions trading and carbon tax policies that integrate a price for CO_2 emissions, as well as unsubsidized energy prices, can greatly encourage EE-related

[23] As footnote 21 above.
[24] As footnote 20 above.
[25] ADP TEM on RE, presentation by the What Next Forum, 2014.
[26] As footnote 21 above.
[27] As footnote 21 above.
[28] Submission made by UNEP under ADP workstream 2 in 2014.

action. China has implemented a number of subnational actions to support carbon markets that are also expected to benefit the expansion of EE.[29] The trading of EE white certificates associated with energy saving obligations is another innovative measure to send price signals associated with EE through market-based transactions. Spotlight box 8 highlights an energy obligation trading system in Denmark and factors for success and good practices that have been observed.

49. **Research and development**: Parties noted that, despite the market success of a number of energy-efficient technologies, there is still a need for further innovative research and development on new and improved products, especially products that are tailored to national circumstances. Japan is currently supporting the research and development of high-performance heat pumps, among other technologies.[30]

Spotlight box 8

Successful energy efficiency policies in various sectors

Denmark: Denmark is among the world leaders in action on energy efficiency (EE), investing heavily in the sector since the global oil price shocks in the 1970s. Denmark expanded its conservation target in 2012 to reduce energy use by 12 per cent by 2020. To support that target, Denmark has implemented a number of successful and cost-effective policies and actions.

The Danish Ministry of Climate, Energy and Building collaborated with trade associations that encompass over 450 energy distribution companies (including oil, natural gas, heating and electricity) to negotiate a pact that establishes a national annual energy savings goal of approximately 3,000 GWt/hour for 2014 and 3,400 GWt/hour for 2015 (an increase of 75 per cent on a previous agreement). Under the pact, each sector is allocated a share of the reduction obligations, which are then distributed to trade association member companies on the basis of market share. When companies reduce energy use (through financial or technical support), they receive credit for the energy savings, which can then be sold to other companies. The national energy saving goals associated with the programme have been exceeded every year since 2007. The programme has also spurred the development of a number of energy servicing companies to support energy savings. Key factors contributing to the success of the programme include:

- **Cost-neutrality** for the utilities involved, as spending on energy savings is passed along to the customer through tariffs, sending a price signal associated with energy efficiency;
- **Flexibility for sectors** to meet targets at the aggregate level in the most efficient way, meaning that there are no requirements for energy savings at the company, just at the sector level.

To further support EE, Denmark also implemented new building codes, with a target of reducing energy use by 70 per cent by 2020. The codes incorporate a number of dynamic elements that are regularly updated to reflect changes in the market, technology, etc. Announcements of updates are made very early to allow industry to prepare and adapt. Denmark highlighted enforcement as a key aspect to ensure the success of building code policies. It also supports voluntary agreements with industry that include energy management actions and implementing cost-effective projects that are incentivized by CO_2 tax rebates.[a]

India: EE-related action is seen as a critical element to support economic growth and related energy needs in India over the coming decades. Energy prices in India are among the highest in the world, and, while there has been significant improvement in EE over

[29] FCCC/TP/2013/8.

[30] ADP TEM on EE, Japan's presentation, 2014.

the last decade, further action is required to realize cost reductions as well as trade and environmental benefits. India's Energy Conservation Act, established in 2001, and the National Action Plan for Climate Change (2008) both encompass EE-related actions, including: the establishment of a Bureau of Energy Efficiency; standards and labelling for appliances; energy-use reporting and norms for energy-intensive industries; EE building codes and the certification of energy managers; and a mandate to support market-based mechanisms for EE. India's standards and labelling programme was successful in creating a 'brand' for energy-efficient appliances that were seen as 'superior'. Key factors that contributed to the success of the programme included:

- Assertive marketing that was ultimately adopted by the manufacturers;
- Combining mandatory and voluntary labelling approaches;
- Regular adjustmentor tightening of standards associated with labels to ensure progress;
- Testing of labelled products;
- Choosing appropriate products to label in relation to the payback period, given that appliances with payback periods of greater than five years are often not successfully marketed through labelling programmes.

India has also adopted EE building codes in the commercial sector, which offers the greatest potential for savings. However, progress is still needed to incorporate the codes at the subnational level and to strengthen overall enforcement. Finally, India adopted Specific Energy Consumption Targets for energy-intensive sectors of the economy, under which Energy Savings Certificates can be traded and penalties will be enforced for non-compliance.[b]

Singapore: With a focus on long-term action on EE Singapore developed a Green Building Master Plan, with the goal of 80 per cent 'Green Mark' certification of buildings by 2030. The initiative certifies buildings in relation to energy and water efficiency, indoor environmental quality, green space integration and the use of eco-friendly materials for construction, and emphasizes high standards for measurement and verification. The programme has already exceeded the target for 2014, with more than 25 per cent of buildings expected to be certified by the end of 2014, making Singapore a global leader in green building certification. With all existing large public-sector buildings on target to reach the 'Green Mark Gold' rating by 2020 and all new public construction mandated to have a 'Green Mark Platinum' rating, Singapore's public sector represents a strong model for replication in other sectors. Incentives implemented to encourage the private sector to follow the model have been very successful in attracting private investment. In addition to building certification, Singapore has regulations in place for energy consumption in buildings and mandates regular energy audits. It also engages in a number of international initiatives to support the transformation of EE.[c]

[a] *Sources*: Denmark's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014; and Danish Energy Agency, 2010. *Why obligation schemes are the solution for European member states during the financial crisis*.

[b] *Source*: India's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

[c] *Source*: Singapore's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

50. The submission from the Environmental Investigation Agency (EIA) emphasized the substantial opportunities for EE associated with phasing out hydrofluorocarbons (HFCs), especially in developing countries, where energy demand associated with air conditioning is expected to increase significantly. Significant efficiency gains (between 5 and 35 per cent) have

been achieved by a number of retailers by replacing refrigerators utilizing HFCs, which has also led to emission reductions. A number of public- and private-sector entities are taking significant action in that regard, including the European Union, Japan, the United States, the Consumer Goods Forum, the Arctic Council and the Climate and Clean Air Coalition. The Montreal Protocol currently provides financial support for the phasing down of HFCs; however, further finance, capacity-building and technology transfer are needed to extend efforts and realize further benefits. In addition to expanding the Montreal Protocol's phase out of HFCs, EIA recommends supporting communication and learning between decision makers in relation to the climate and ozone and participation in related workshops and forums in order to move the relevant work forward.[51]

Table 6

Energy efficiency policy menu (for select policy options and examples highlighted during the technical expert meetings and in relevant submissions)

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
Policy option: Standards and labelling (S&L) programmes[a]	
• **Identify available resources**: Designated entities must explore the availability of resources for programme design, including: legal resources (such as mandates and an authorized agency to implement an S&L programme); financial resources (budget and good practices from other countries that can be leveraged to reduce programme development costs); human resources (staff and training needs for technical and market analysis, development of standards, designing and implementing communication strategies, etc.); facilities (central office, test labs and field offices for monitoring and enforcement); and a managing institution to implement and oversee the programme • **Regional harmonization**: Implementers may also want to consider harmonizing S&L programmes at the regional level at this point in the planning process • **Collect market data**: Implementers should begin to collect key market data at this stage, including projected market trends, new technologies, performance data, etc. • **Determine policy approach**: Various options related to the policy approach should be considered, including: mandatory vs. voluntary programmes; standards vs. labels; endorsement vs. comparative labels • **Product selection**: Products should also be selected at this stage on the basis of criteria such as energy use, cost, mitigation potential, etc. • **Ensure testing capabilities**: Test procedures can be developed on the basis of international good practices and should occur at accredited institutions. They should also be inexpensive, repeatable and accurate • **Assess and establish standards**: When establishing standards, it is important to ensure the affordability of efficient products, to determine the best approach to incentivize businesses to produce and support the products, and to understand how standards might have an impact on different income groups • **Raise awareness through a communications campaign**: Communication campaigns complement and support the success of S&L programmes by raising consumer awareness of the benefits of energy efficiency (EE) associated with products included in the S&L programme • **Monitor, report and evaluate**: to ensure compliance, to provide a	• China – Energy Label scheme • European Union – Ecodesign Directive • Ghana – energy efficiency S&L programme • India – S&L programme • Japan – Energy Saving Labelling System • United States – ENERGY STAR programme

[51] Submission by Environmental Investigation Agency under the ADP workstream 2 made in 2014.

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
mechanism to assess programme outcomes and to redesign the programme over time as needed	
Policy option: Energy performance standards (EPS) and obligations (including trading schemes)[b, c]	
• **Engage multiple stakeholders in developing performance standards (particularly the private sector)**: Processes to design standards should involve the active engagement of the private sector and other stakeholders to ensure industry and other needs and interests are considered and addressed. In many cases, the private sector can also support governments in better understanding customer needs in relation to standards. Technical expert groups can also be formed to consider policy, regulation and finance, quality and environmental issues in greater detail and to inform the design of standards • **Support long-term action and flexibility**: EPS design should take a long-term and flexible perspective that allows for the increasing rigour of standards over time. This allows the private sector sufficient time to make adjustments to meet standards and reduces risk associated with policy uncertainty • **Communicate the benefits**: EPS programmes should be coupled with effective communication campaigns to raise awareness of the economic, environmental and social benefits of related EE improvements • **Ensure technology and product neutrality**: Policymakers should avoid picking winners in relation to standards, instead allowing for private-sector competition in meeting the standard in efficient manner	• Denmark – Energy Reduction Obligation and trading mechanism • India – Perform, Achieve and Trade scheme • Japan – Top Runner Program
Policy option: Building standards and codes[d, e]	
• **Establish an effective governance and institutional structure** • **Establish local leadership** and dedicated staff to support the implementation of codes • **Design and implement a long-term training strategy** for building designers and architects, contractors and construction workers to meet building codes • **Establish achievable codes** in relation to locally available materials • **Adopt tools and services** to streamline inspection/permit processes • **Design and implement awareness campaigns** • **Evaluate the programme regularly** to support improvements and adopt emerging good practices	• Denmark – building codes • France – 2012 Building Energy Code for New Buildings • India – EE building codes • Netherlands – investor payback schemes for refurbishment of rented buildings by landlords • Singapore – Building Control Act and Green Mark Scheme • Tunisia – Building Energy Code and Labelling Scheme
Policy option: Fuel efficiency standards[f, g]	
• **Improve and share information**: It is crucial to support information provision and experience sharing on the design and implementation of fuel efficiency actions and policies with policymakers. Information on fuel consumption and associated CO_2 emissions provided to consumers should be improved to support informed decision-making • **Set standards and design fiscal policy**: Regulatory standards for fuel consumption or CO_2 emissions send a clear signal and provide certainty to the private sector and consumers on the viability of investments. Vehicle taxes can be designed in relation to fuel economy or CO_2 emissions to support consumer uptake of EE vehicles • **Engage the private sector**: Working closely with the private sector in designing fuel efficiency programmes can support successful outcomes	• Brazil – fuel economy standard • Canada – greenhouse gas (GHG) standard • European Union – CO2 standard • Japan – Top Runner Program • Mexico – fuel economy/GHG standard • South Korea – fuel economy/GHG standard

Select policy options and key elements of the enabling environment to support successful policy replication and implementation	*Select country-specific examples*
Policy option: Lighting measures[c, h]	
• **Establish national regional governance and leadership**: It is important to develop strategies for efficient lighting at both the national and regional levels to ensure high-level political support and coordination across relevant entities. Strategies can include standards, labels and quality control approaches, which can be harmonized at the regional level. Successful programmes are also supported by robust education and public-awareness initiatives. Integrating lighting technology road maps at the national and regional levels can help to support technology transfer • **Strengthen technical capacities**: The training of government staff to support programme implementation may be necessary, as well as measures to enhance monitoring and enforcement processes and capacities. Training and investment to support the establishment of collection and recycling programmes may be necessary • **Design financial incentives**: Financial incentives and other fiscal mechanisms may be necessary to support the uptake of efficient lighting technologies	• Colombia – replacement of incandescent light bulbs under the Programme on Rational and Efficient Use of Energy and Other Forms of Non-Conventional Energy • Ghana – incandescent light bulb phase-out programme
Policy option: Incentives and subsidies[d, h]	
• **Strong political leadership** is required to communicate to the public the broader economic development benefits associated with tax incentives (e.g. jobs, new enterprises), given the tax revenue implications • **he design of tax incentives** should: ensure that the size of the incentive is adequate to attract private-sector interest, but not overly burdensome on the tax revenue base; have a long enough time-horizon to provide a significant market signal, but also be flexible in supporting reductions over time; include consumer education and marketing approaches related to return on investment; and include the development of a plan to review the effectiveness of the tax incentives programme	• Japan – tax incentives for facilities, buildings and automobiles and subsidies for facility purchasing and interest payments • Netherlands – Accelerated Depreciation of Environmental Investments Measure • South Africa – Section 121 Tax Allowance for manufacturing projects • United States – home, vehicle and appliance efficiency tax credits

Note: The policy menu should be complemented by the information on cooperative initiatives presented in box 2 of the main text of this updated technical paper and additional initiatives presented on the portal on cooperative initiatives, which is available at <http://unfccc.int/focus/mitigation/items/7785.php>.

[c] *Source*: Information adapted from Collaborative Labelling and Appliance Standards Programme. 2011. *Standards and Labels: Transforming the Market for Energy-Efficient Appliances*.

[d] *Source*: Regulatory Assistance Project. 2012. *Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes*.

[e] *Source*: Consumer Federation of America. 2013. *Energy efficiency performance standards*.

[f] *Source*: Renewable Energy and Energy Efficiency Partnership, Alliance to Save Energy and American Council On Renewable energy. 2010. *Compendium of Best Practices: Sharing local and state successes in energy efficiency and renewable energy from the United States*.

[g] *Source*: International Energy Agency.2008. *Energy Efficiency Requirements in Building Codes, Energy Efficiency - Policies for New Buildings*.

[h] *Source*: Global Fuel Economy Initiative. 2010. *Fuel Economy State of the World 2014: The World is Shifting into Gear on Fuel Economy*.

[i] *Source*: Adapted from the submission by the United Nations Environment Programme under workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action in 2014.

[j] *Source*: See <http://www.kpmg.com/global/en/issuesandinsights/articlespublications/green-tax/pages/energy-efficiency.aspx>.